Volume 44, Number 1
January 1973

# Field Museum of Natural History Bulletin

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# Field Museum of Natural History Bulletin

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January 1973

**2 Volunteers Lend a Hand**
Carolyn Blackmon
they are major contributors to Field Museum's work, and more are needed

**5 Calendar**

**6 Members**
what the Museum means to them and what they mean to the Museum

**8 Capital Campaign**
a report on work accomplished and in progress

**Appointment Calendar for 1973**

Field Museum of Natural History
Director, E. Leland Webber

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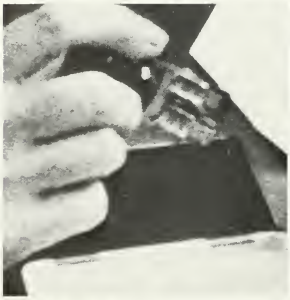
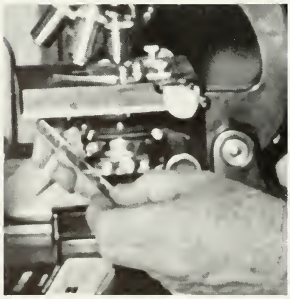
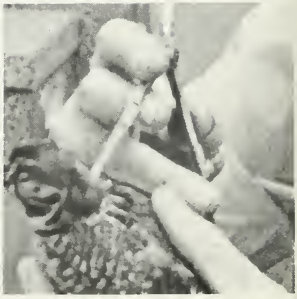


# Volunteers Lend a Hand

Carolyn Blackmon

Throughout the history of Field Museum, volunteers have provided much-needed and greatly appreciated assistance. In 1971, for example, 71 volunteers gave 1,732 days of work. This year the Museum has enlarged its volunteer enrollment to 115, with the assistance of grants from the National Endowment for the Arts and the Illinois Arts Council. The funds are used in part to provide administrative and secretarial support for the growing program.

What do volunteers do? Their jobs are as diverse as the Museum's collections. More than 13 million specimens need to be cataloged, preserved, and maintained. Numerous clerical and technical tasks must be performed to facilitate the research activities of the scientific staff. School groups need instruction, and materials must be prepared for exhibition.

Some tasks take a short time; others are long-term. Not long ago the Geology Department needed someone to help in the paleontology laboratory removing the rock that encases fossil specimens brought in from expeditions. A likely prospect appeared, and her eyes sparkled when asked if she would like to start with a turtle. She thought that sounded fine—a little turtle should be an easy beginning. She had been shown the techniques and how to use the tools, and the preparator or a curator would always be around to supervise and answer questions or give help. The specimen was brought in from storage—a giant sea turtle, 40 million years old, his shell five feet in circumference, weighing fifty pounds. One and a half years, hundreds of hours of picking, and innumerable cups of coffee later, a fine Eocene specimen emerged to be placed in the study collection.

Many continuing tasks involve collection maintenance, such as oiling rare books, changing faded identification tags on specimens, or removing dust from stored artifacts. Records must be kept as well, since inaccurate information renders specimens and artifacts almost useless for scientific study. With training and staff supervision, volunteers perform many of these important tasks. Some have even developed their Sherlock Holmes instincts and, through diligent research, have found new data or better ways for organizing materials.

Volunteer instructors lead tours for groups of school children, using Museum exhibits, specimens, and artifacts. Since staff and volunteers can provide tours to only 20 percent of the 350,000 school children who come to the Museum every year, more volunteer instructors are needed to help the Museum expand its educational offerings.

Who are Museum volunteers? They are people who have time to give—maybe one or two days a week, or maybe even five. They may have a hobby or interest they would like to put to use, related to birds, rocks, pottery, history, flowers, mushrooms, or model-making. Such a list could go on and on because a wide variety of skills and interests are needed in museum work. Retirees, college students, and mothers with grown children or easy access to sitters also serve as volunteers. Almost any job experience may have some relationship to museum work. Librarians, secretaries, doctors,

carpenters, bookkeepers, and countless others have skills that can be utilized. Most of all, volunteers are curious, want to learn something new, and have time and some basic skills to give. The Museum can offer them an appropriate niche where, after training in professional procedures and standards, they can continue to expand their interests and knowledge.

How does one become a volunteer? An interview is held to determine whether an opening is available that matches a candidate's skills and interests. If an assignment is made, Museum staff provide on-the-job training in the areas of science, administration, and exhibition. For volunteer instructors, a formal training program is held one day a week for twelve weeks, spring and fall.

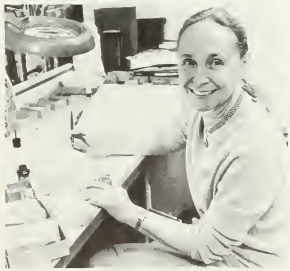
There are now more than fifty openings for volunteers. Among the many needs: a gardener to take care of plants in Stanley Field Hall, typists and catalogers in virtually every department, furniture refinishers, cabinet makers, photographers, illustrators, upholsterers.

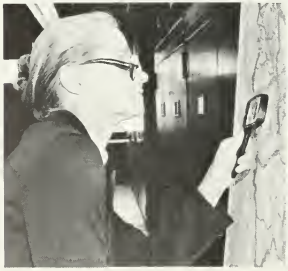
A comprehensive list of volunteer opportunities is available.

If you would like to arrange for an interview to learn more about our volunteer program, please call or write me. An introductory tour can be arranged for groups whose members might be interested in learning about volunteer opportunities at the Museum.

*Carolyn Blackmon, a former Field Museum volunteer, is Coordinator of Special Educational Services in the Department of Education, Field Museum.*

Chicago Tribune photo.





Photos by Ed Jarecki.

# CALENDAR

## Exhibits

Through January 21

**Paracas Whistling Jar** from the Ica Valley of Peru, Ocucaje Phase II (ca. 700 B.C.), is featured in the South Lounge. The unique pottery jug, which makes a whistling sound when water is poured out of it, is the earliest known of its type. It is the gift of Mr. and Mrs. Raymond J. Wielgus.

Continuing

**Greenland: Arctic Denmark,** a major exhibition covering all aspects of the history and culture of the world's largest island. The extensive collection of archaeological and ethnological material is supplemented by photographs and a daily film program to illustrate various areas of economic development and social change in modern Greenland. The exhibition is sponsored by the Royal Danish Embassy and is shown under the auspices of the Smithsonian Institution Traveling Exhibition Service. Through March 8. Hall 27.

**A New Spirit in Search of the Past:** Archaeology and Ecology in the Lower Illinois River Valley, an exhibit explaining the "new" archaeology as reflected in the Illinois Valley Archaeological Program's excavation of the Koster Site, directed by Dr. Stuart Struever of Northwestern University. Through March 25. Hall 9.

**Color in Nature,** an exhibit examining the nature and variety of color in the physical and living world and how it functions in plants and animals. Continues indefinitely. Hall 25.

**Field Museum's 75th Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Musical Program

Sunday, January 21

**Metropolitan Youth Symphony** presents a free concert at 2:30 p.m. in the James Simpson Theatre.

## Film Program

A series of films relating to the "Greenland: Arctic Denmark" exhibit is shown continuously beginning at the following times:

Monday-Thursday: 10 a.m. and 1 p.m.
Friday: 10 a.m., 1 p.m., and 6 p.m.
Saturday and Sunday: 11 a.m. and 2 p.m.

## Meetings

**January 9:** 8 p.m., Chicagoland Glider Council
**January 10:** 7:30 p.m., Windy City Grotto, National Speleological Society
**January 11:** 8 p.m., Chicago Mountaineering Club
**January 14:** 2 p.m., Chicago Shell Club

## Children's Program

Continuing

**Winter Journey for Children,** "Dog Meets Man," a free self-guided tour exploring the many aspects of man's partnership with "his best friend" since prehistoric times. Youngsters are provided with a questionnaire which routes them through Museum exhibit areas. All boys and girls who can read and write may join in the activity. Journey sheets are available at Museum entrances. Through February 28.

## Coming in February

Opens February 14

**Below Man's Vision:** Electronic Windows to Unseen Worlds, an exhibit exploring the world of details in common objects and familiar plants and animals, and offering glimpses into current research activities. Over 200 photographs, displayed at up to 200,000 times life size, introduce a previously unseen world. Through July 15. Hall 18.

**January Hours**

9 a.m. to 4 p.m. Monday through Thursday, 9 a.m. to 9 p.m. Friday, 9 a.m. to 5 p.m. Saturday and Sunday.

Closed New Year's Day.

The Museum Library is open 9 a.m. to 4 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

# MEMBERS

Field Museum Members are a special group of people. They have special concern and interest in the world around them—in learning more about it themselves and in helping their children and grandchildren learn about it. A youngster once informed his parents that his visit to the Museum couldn't have been "educational" because it was fun. The wise parents knew otherwise—that it was "educational" *because* it was fun—but kept that to themselves.

Field Museum Members are interested in the diversity of human ways of life. They like to cross the barriers of time and distance to learn about other cultures, or about the very beginnings of culture itself among the remote ancestors of us all. They are interested in the animal life throughout the world, and in the plant life that is the ultimate sustenance of all other life. They are interested in geologic history and in the physical nature of our own and other planets.

These are some of the reasons they are Field Museum Members—because the Museum brings all these aspects of the world almost to their doorstep.

Field Museum membership always includes all members of the family, so any or all of them can visit whenever they wish, free, and bring guests too. There is so much to see that no matter how often one comes, there is always something new—a part of the Museum not yet discovered, or a new exhibit to be seen.

Special events throughout the year are arranged for Members. In the gala atmosphere of the annual Members' Nights they (and their guests) are invited behind the scenes into the scientific research, education, and exhibition departments to see what the Museum staff are working on. They are invited to special Members' previews of new exhibits. The children's workshop programs, soon to be increased in frequency, offer young people the opportunity to work directly with Museum specimens as they learn about a subject that particularly interests them.

And even if Members cannot come to the Museum often, it goes out to them monthly between the covers of the *Bulletin.* Articles ranging from A(nthropology) to Z(oology) might give background for a new exhibit; or describe the ecological dilemma posed by use of our park lands; or expose the destructive and dangerous trafficking in antiquities; or report some exciting finds of a fieldwork expedition. The *Bulletin* also keeps them informed of activities and special events at the Museum.

If you are already a Field Museum Member, we hope you take full advantage of all these benefits, and also invite your friends to share them with you. We would like them to become our friends too. We would be especially pleased if you wished to give one or more of them a gift membership. An announcement greeting card will be sent in your name.

For each new membership we also send a portfolio of four color reproductions of bird paintings done by the distinguished American artist Louis Agassiz Fuertes on a Field Museum expedition to East Africa.

If you are not a Field Museum Member, you are probably one of those special, concerned people who should be. The Museum is a private institution whose activities and scientific work are largely dependent for financial support on memberships, contributions, and endowments from people like you.

Photo by Fred Huysmans.

Clip and mail to: Field Museum of Natural History, Roosevelt Rd. at Lk. Shore Dr., Chicago, Ill. 60605

*Please send the following Gift Membership*
☐ *Annual $15* ☐ *Associate $150* ☐ *Life $500*
*in my name to:*

Gift recipient's name

Address

City State Zip

☐ *Check enclosed payable to Field Museum*
☐ *Please bill me as follows:*

My name

Address

City State Zip

☐ *Send bird prints to gift recipient*
☐ *Send bird prints to me*

Please put information for additional gift memberships on a separate sheet

Clip and mail to: Field Museum of Natural History, Roosevelt Rd. at Lk. Shore Dr., Chicago, Ill. 60605

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Please put information for additional gift memberships on a separate sheet

We appreciated Jimmy's letter, as we appreciate all of the thousands of letters that come in during the year from people who have enjoyed a visit to Field Museum. Jimmy raises a good question—"I wonder how you can keep it in good shape." So, for Jimmy and all other friends of Field Museum, here is an answer.

How we "can keep it in good shape" for all the different kinds of people who use and enjoy the Museum is a big problem. That is why we are conducting a $25,000,000 Capital Campaign. The money is sorely needed for many rehabilitation projects to keep the Museum a usable facility.

Some of this building improvement and renovation work has already been completed. Other projects are now being started.

Almost $3,000,000 of advance gifts already received has been allocated for projects which have just been completed or are presently underway. The completed work, representing an investment of $861,000, includes quarters for the Exhibition Department and additional space created for the Zoology Department by filling in a light well, both on the fourth floor; the new Hall of Jades on the second floor; and the Malvina Hoffman Gallery overlooking Stanley Field Hall.

Projects in progress, at an estimated cost of $1,920,500, include the following rehabilitation and modernization work:

| | |
|---|---|
| Exterior tuckpointing (partial) | $ 77,000 |
| Interior freight elevator | 65,000 |
| Fire pump | 25,000 |
| Zoology laboratories | 375,000 |
| Boiler conversion | 145,000 |
| Painting Stanley Field Hall | 55,000 |
| Electrical system | 980,000 |
| Emergency generator | 8,500 |
| Renovation of taxidermy area | 45,000 |
| Plumbing, drainage, and toilet system | 120,000 |
| Scanning electron microscope laboratory | 25,000 |

Other projects also underway to upgrade the physical plant include a security survey, a climate control study, and improvement of ventilating and lighting in Halls 18 and 19.

Projected further improvements not yet begun include replacement of more than 1,000 large exterior windows; rebuilding of exterior stairs and entrances; modernized food service facilities; installation of sound-deadening materials in several areas; air conditioning plus a totally modern air treatment system; installation of elevators to the public and non-public areas of the Museum; and modernization of the Lecture Hall and the James Simpson Theatre.

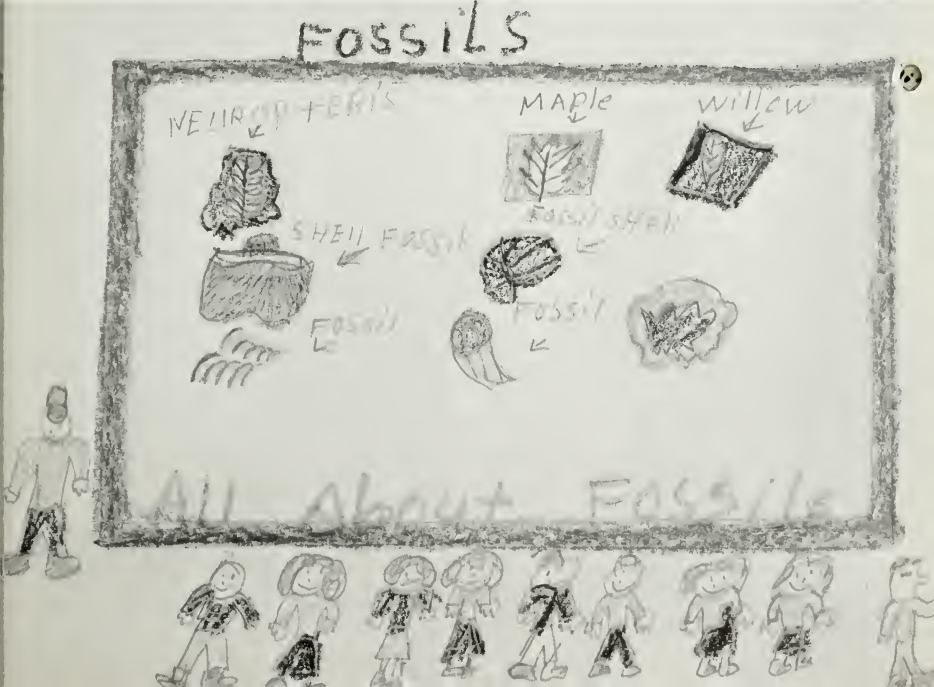
This first Capital Campaign in Field Museum's 79-year history was launched in September 1971. The $25,000,000 goal should be reached by September 1974. Half of the funds must be collected by the Museum from private sources. The other half will be in matching public funds generated through the bonding authority of the Chicago Park District.

The Museum is seeking to raise its share through corporate, foundation, and individual gifts. In its behalf, corporation executives as well as other individuals have been explaining the Museum's needs throughout the community. To date, gifts and pledges totaling approximately $8,000,000 have been received.

That leaves $4,500,000 remaining to be raised by the Museum. This need presents a once-in-a-lifetime challenge and opportunity for our friends. We need their help to ensure that our building is adequate for the increasingly important role of Field Museum in the educational, cultural, and recreational life of our community.

Dear Museum Director,
I like the Museum very much and it was fun. I wonder how you can keep it in good shape. And the best I like of all was the Fossils & have a book about Fossils ?.

Jimmy



Cheetah in Nairobi National Park. Photo by Richard Keane.

# january 1973

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | Field Museum Closed NEW YEAR'S DAY 1 | Winter Journey for children continues at Field Museum 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

Field Museum hours:
9 am to 4 pm Mondays through Thursdays;
9 am to 9 pm Fridays;
9 am to 5 pm Saturdays and Sundays

DECEMBER 1972

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FEBRUARY 1973

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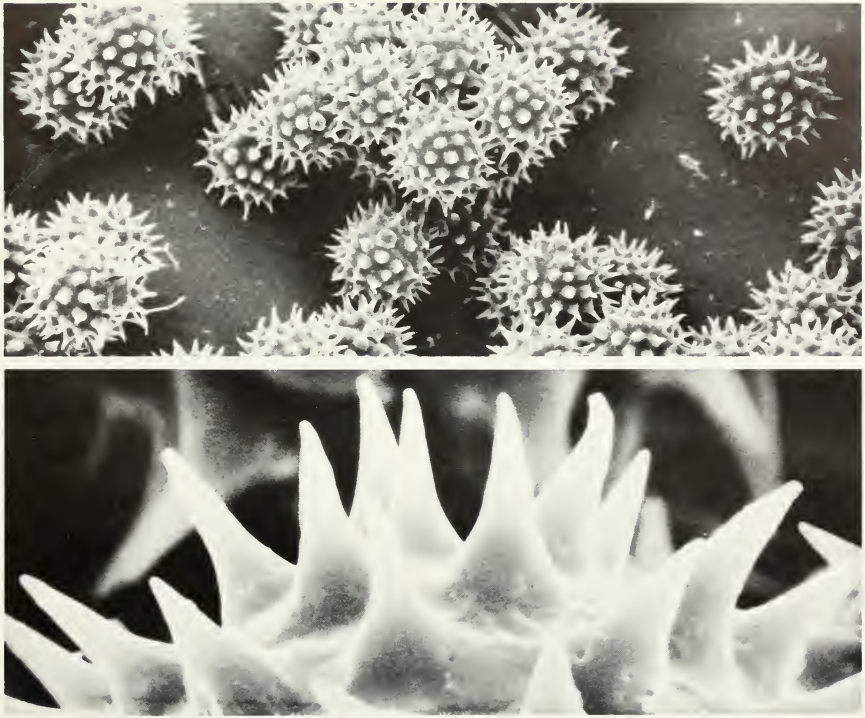

Pollen of Jerusalem artichoke as photographed by the scanning electron microscope; magnification X 970 and X 9,920. Photos by Alan Solem.

# february 1973

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | 1 | 2 | CHINESE NEW YEAR 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | LINCOLN'S BIRTHDAY 12 | 13 | Exhibit "Below Man's Vision: Electronic Windows to Unseen Worlds" opens at Field Museum, Hall 18<br>VALENTINE'S DAY 14 | 15 | 16 | 17 |
| 18 | WASHINGTON'S BIRTHDAY 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | | | |

Field Museum hours:
9 am to 4 pm Mondays through Thursdays;
9 am to 9 pm Fridays;
9 am to 5 pm Saturdays and Sundays

JANUARY 1973

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MARCH 1973

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Photo by William Burger.

# march1973

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | Spring Journey for children begins at Field Museum<br>1 | 2 | Free film-lecture, "Golden Kingdoms of the Orient," 2:30 p.m. at Field Museum<br>3 |
| 4 | 5 | 6 | 7 | 8 | 9 | Free film-lecture, "Exotic West Pakistan," 2:30 p.m. at Field Museum<br>10 |
| 11 | 12 | 13 | 14 | 15 | 16 | Free film-lecture, "The New Alaska," 2:30 p.m. at Field Museum<br>17 |
| 18 | 19 | 20 | 21 | 22 | 23 | Free film-lecture, "All Around Australia," 2:30 p.m. at Field Museum<br>24 |
| 25 | 26 | 27 | 28 | 29 | 30 | Free-film lecture, "Yugoslavia," 2:30 p.m. at Field Museum<br>31 |

Field Museum hours:
9 am to 5 pm daily
except 9 am to 9 pm
Fridays

FEBRUARY 1973

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APRIL 1973

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Photo by Joe Timmer.

# april1973

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | | Free film-lecture, "Michigan Odyssey," 2:30 p.m. at Field Museum<br>Free film for children, 10:30 a.m. at Field Museum |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | Free film-lecture, "Russia—From the Caucasus to Outer Mongolia," 2:30 p.m. at Field Museum<br>Free film for children, 10:30 a.m. at Field Museum |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | | | | | | Free film-lecture, "Jerusalem, Jerusalem," 2:30 p.m. at Field Museum |
| 15 | 16 | PASSOVER 17 | 18 | 19 | GOOD FRIDAY 20 | 21 |
| | | | | | | Free film-lecture, "The Open Arms of Portugal," 2:30 p.m. at Field Museum<br>Museum Traveler Day; free film for children, 10:30 a.m. at Field Museum |
| EASTER 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | | | | | |

Field Museum hours:
9 am to 5 pm daily
*except* 9 am to 9 pm
Fridays

MARCH 1973

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MAY 1973

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Newly emerged seventeen-year cicada. Photo by D. Dwight Davis.

# may 1973

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3<br>Members' Night at Field Museum | 4<br>Members' Night at Field Museum | 5<br>Exhibit "Seventeen-Year Cicada: A Strategy for Survival" opens at Field Museum, Hall 9 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| MOTHER'S DAY 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21<br>Field Museum permanent building opened in Grant Park 52 years ago, 1921 | 22 | 23 | 24 | 25 | 26 |
| 27 | MEMORIAL DAY 28 | 29 | 30 | 31 | | |

Field Museum hours:
9 am to 6 pm daily
except 9 am to 9 pm
Fridays

APRIL 1973

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JUNE 1973

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Geology expedition at Sage Creek, South Dakota. Photo by Dr. John Clark.

# june1973

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| FATHER'S DAY 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |

Summer Journey for children begins at Field Museum

Field Museum first opened in Jackson Park 79 years ago, 1894

Field Museum hours:
9 am to 6 pm daily
*except* 9 am to 9 pm
Fridays and nights of
Grant Park concerts

MAY 1973

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JULY 1973

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| 29 | 30 | 31 | | | | |

Ghost crab. Photo by Richard Pearson.

# july 1973

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | Free movies for children, 10 a.m. and 1 p.m. at Field Museum | | |
| 1 | 2 | 3 | INDEPENDENCE DAY 4 | 5 | 6 | 7 |
| | | | | Free movies for children, 10 a.m. and 1 p.m. at Field Museum | | |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | | | | Free movies for children, 10 a.m. and 1 p.m. at Field Museum | | |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| | | | PUERTO RICAN CONSTITUTION DAY | Free movies for children, 10 a.m. and 1 p.m. at Field Museum | | |
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Field Museum hours:
9 am to 6 pm Mondays, Tuesdays, Thursdays;
9 am to 9 pm Wednesdays, Fridays, Saturdays, Sundays

JUNE 1973

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AUGUST 1973

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Hippos, Serengeti National Park. Photo by Richard Keane.

# august 1973

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Field Museum hours:
9 am to 6 pm Mondays,
Tuesdays, Thursdays;
9 am to 9 pm
Wednesdays, Fridays,
Saturdays, Sundays

JULY 1973

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SEPTEMBER 1973

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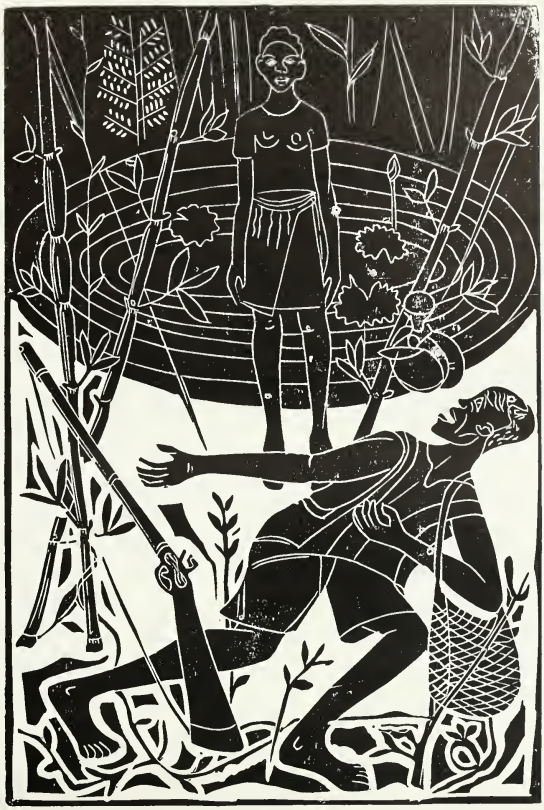

"Taiba finds Afna in her fine clothes," a linoleum block print by Bruce Onobrakpeya, whose work will be shown in the exhibit on contemporary African arts scheduled to open this month at Field Museum.

# september 1973

| S | M | T | W | T | F | S |
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| | | | | | Fall Journey for children begins at Field Museum | 1 |
| 2 | LABOR DAY 3 | 4 | 5 | 6 | 7 | 8 |
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| Charter for Columbian Museum of Chicago, first name of Field Museum, obtained 80 years ago, 1893<br>MEXICAN INDEPENDENCE DAY 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | ROSH HASHANAH 27 | 28 | 29 |
| 30 | | | | | | |

Field Museum hours:
9 am to 5 pm daily
except 9 am to 9 pm
Fridays and September
1 and 2; 9 am to 6 pm
September 3

AUGUST 1973

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OCTOBER 1973

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Sapelo Island off Georgia.
Photo by Ernst A. Gramatzki.

# october 1973

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| 7 | COLUMBUS DAY 8 | 9 | 10 | 11 | 12 | 13 |
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| 21 | VETERANS' DAY 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | HALLOWE'EN 31 | | | |

Field Museum hours:
9 am to 5 pm daily
*except* 9 am to 9 pm
Fridays

SEPTEMBER 1973

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NOVEMBER 1973

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Wild Turkey, first plate published in the elephant folio edition of John James Audubon's *The Birds of America*, a copy of which is on display in Field Museum's North Lounge.

# november 1973

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| 18 | 19 | 20 | 21 | THANKSGIVING DAY 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | |

Field Museum hours:
9 am to 4 pm Mondays through Thursdays;
9 am to 9 pm Fridays;
9 am to 5 pm Saturdays and Sundays

OCTOBER 1973

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DECEMBER 1973

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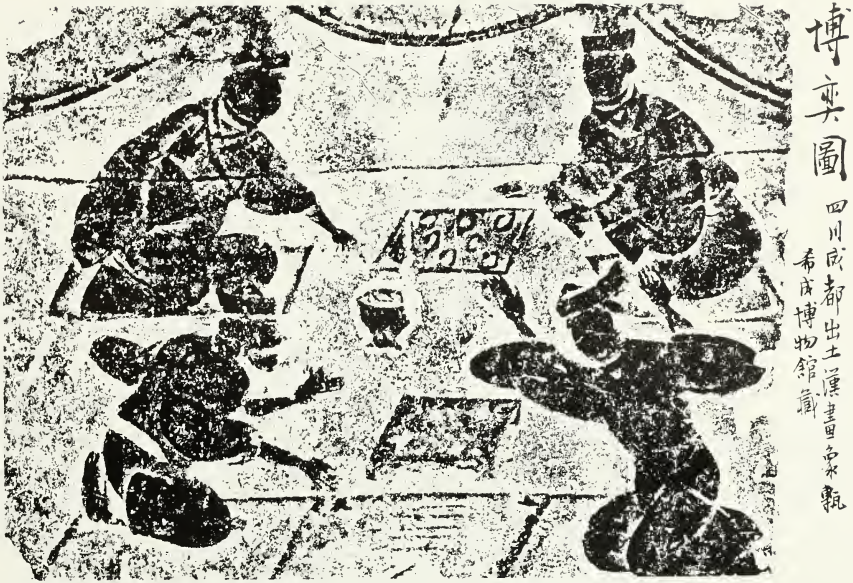


A game of *liu-po*—Han period rubbing from Ssu-ch'uan Province, China, in Field Museum collection.

# december 1973

| S | M | T | W | T | F | S |
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| | | | | | | Winter Journey for children begins at Field Museum 1 |
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| 16 | 17 | 18 | 19 FIRST DAY OF HANUKKAH | 20 | 21 | 22 |
| 23 | 24 | Field Museum Closed CHRISTMAS DAY 25 | 26 | 27 | 28 | 29 |
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Field Museum hours:
9 am to 4 pm Mondays through Thursdays;
9 am to 9 pm Fridays;
9 am to 5 pm Saturdays and Sundays

NOVEMBER 1973

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JANUARY 1974

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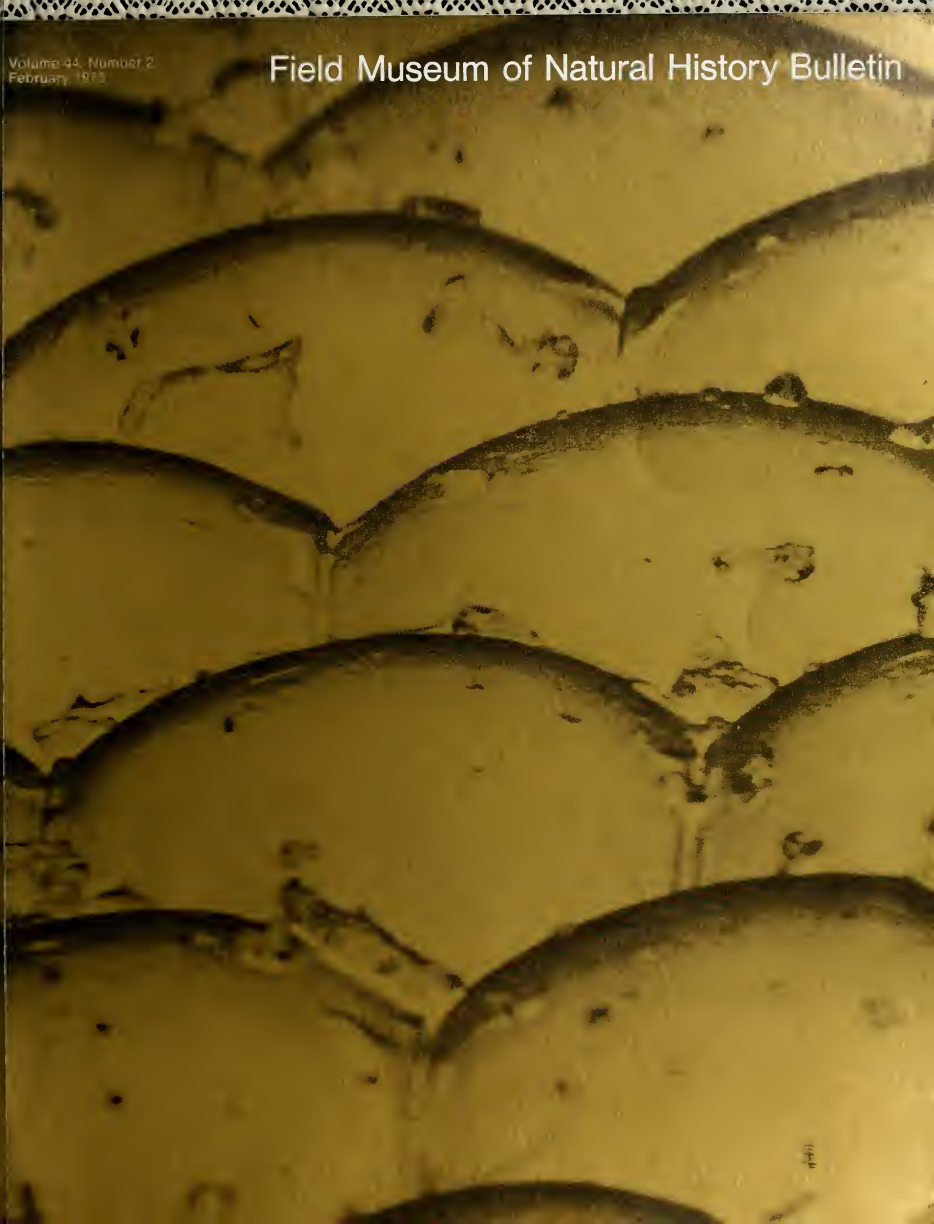
Volume 44, Number 2
February 1973

# Field Museum of Natural History Bulletin



**Field Museum of Natural History Bulletin**

Volume 44, Number 2
February 1973

Cover: Scanning electron microscope view of a few of the 4,000 facets on the compound eye of a housefly; shown 7,550 times life-size on the cover, 2,100 X here. Specimen preparation for SEM viewing involves coating it in a high vacuum with a few-molecules-thick layer of gold or other conductive metal. Dirt particles are pollutants from Chicago air that settled on the specimen while it was being prepared for photography.

**2 Below Man's Vision: Electronic Windows to Unseen Worlds**
Alan Solem
using the scanning electron microscope, the structure of things can be revealed at magnifications up to 100,000 times life-size

**8 The Most Stupendous Earthquake of Them All**
Edward J. Olsen
it happened here in the midwest, 162 years ago; could it happen again?

**11 Thismia**
Louis O. Williams
an important gift to the botany collections recalls the mystery of this rare plant

**12 Printing Alexander Wilson's Copper Plates**
Richard A. Davis
a print-maker "discovers" some of these early-1800s engraved copper plates in Field Museum's Library

**16 Capital Campaign**
gifts from Women's Committee for Capital Campaign nearing $1 Million

**Calendar**

Field Museum of Natural History
Director, E. Leland Webber

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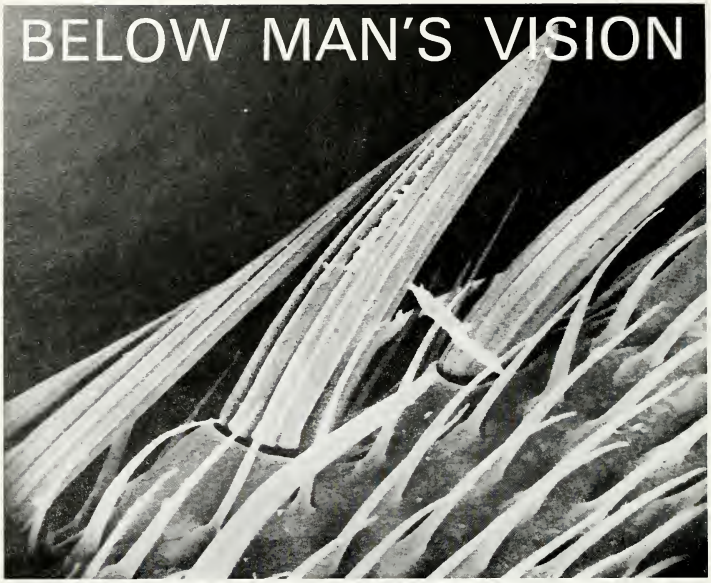



# electronic windows to unseen worlds

Scheduled for mid-February opening, the exhibit "Below Man's Vision: Electronic Windows to Unseen Worlds" presents almost 300 pictures of a world that is hidden from man's unaided eye. Whether its focus was on a common object such as a torn piece of paper or sugar crystal, or details from the body of a housefly, a beam of electrons produced images that were photographed and then displayed at 50 to 200,000 times life-size.

The instrument responsible for this is the scanning electron microscope. Perfected only in the mid-1960s, it permits inquiring minds to explore not only far beyond the limits of light microscopes, but to perform photographic miracles. Using this microscope, one can study objects at anywhere between 10 and 100,000 times life-size. Clicking a dial changes the magnification. At the same time, the specimen can be tilted, rotated, moved back and forth, and the "lighting" altered in various ways. When adjustments are completed, a photograph can be made. The depth of field—that part of the picture in sharp focus—will be 500 times as great as with an optical microscope at the same magnification.

Most people have peered briefly through a microscope in a school biology class, delving into the guts of a grasshopper, worm, or frog. Perhaps they looked at a glass slide with living protozoans or bits of plant tissue. A major problem in all these situations is that only part of the object could be seen easily at any one time. If a near section was in sharp focus, the rear portion was fuzzy in outline, and vice versa. The problem was that the depth of field (area in sharp focus) was less than the thickness of the object being studied.

Photographers have the same problem. Everybody has snapshots of family affairs in which one member near the camera has a blurred face, those in the middle of the group can be seen without difficulty, and a few in the background also are unrecognizable blurs. The lenses of cameras and optical microscopes have a depth of field that is only a fraction of the picture width. With electronic viewing, this problem is almost eliminated. In a picture area one-fifth of an inch

square, for example, the area in sharp focus is more than one inch deep.

In practical terms, the difference in depth of field is seen in the photos on the next page of a one-thirtieth inch long beetle. The optical photograph, taken with the best available microscope equipment, shows only a small part of the beetle's belly in sharp focus. Details even on this surface are obscure and the "halo" effect of the light is distracting to the viewer.

In contrast, the scanning electron microscope shows the whole beetle in sharp focus, the hairs in each pit on the surface are clearly visible, and the "lighting" on the specimen is close to natural daylight.

This ability of the scanning electron microscope to *illustrate* well is causing as great a revolution as is its ability to see details that could not be seen before. Communicating what has been seen to other scientists always has been a major problem.

Man first began to use microscopes in the study of small objects during the early to mid-1600s. The scientists of this time had to be artists or else hire artists to illustrate their studies. A part of the exhibit "Below Man's Vision" shows samples of their work. The anatomy of plants, details of insects, and glimpses of bacteria by Dutch and English 17th century scientists are impressive as art. They become awe inspiring when one realizes the simple equipment available to these workers.

An exact copy of a microscope used by Anton von Leeuwenhoek, perhaps the most famous of the Dutch microscopists, was loaned by the Rijksmuseum voor de Geschiedenis der Natuurwetenschappen. The whole instrument is 2¾ inches long. The specimen is mounted on a pin point. Three screws adjust its place before the lens, which is a bead of glass embedded in the brass plate of the microscope.

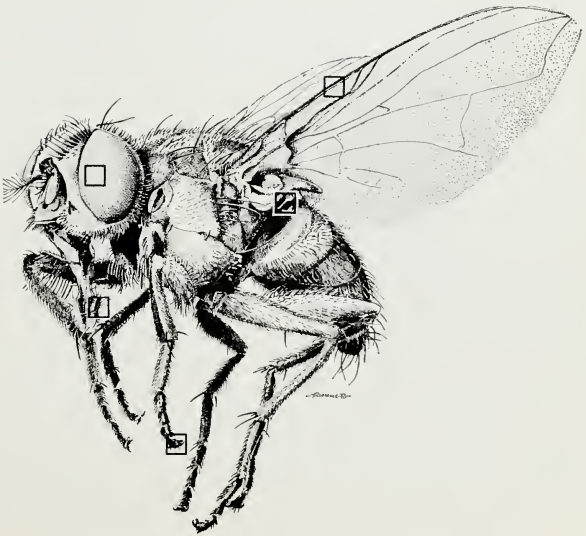
Held in a bright shaft of summer sunlight, this simple looking device let Leeuwenhoek see bacteria in 1683. Even the best optical microscopes today can penetrate but little further into the world of unseen detail.

Photography partly replaced artists in communicating details to other scientists, but the depth of field was limited, more so with the compound than the dissecting microscope. The compound microscope is used in studying protozoa or other specimens mounted on glass slides. The light source is below the object, and waves of light are *transmitted through* a thin specimen into the microscope and then to the eye of the viewer.

The dissecting microscope uses another pattern of viewing. The light source is above the object, and light is *reflected off* the surface into the microscope and then to the eyes of the viewer.

Electrons can be used for viewing both *transmitted* and *reflected* modes. The transmission electron microscope (TEM), in use since the 1930s, *transmits* beams of electrons *through* a very thin object. The scanning electron microscope (SEM) hits the surface of the object with a beam of electrons, then uses electrons emitted from the object to form a picture. Thus the SEM is comparable to the dissecting

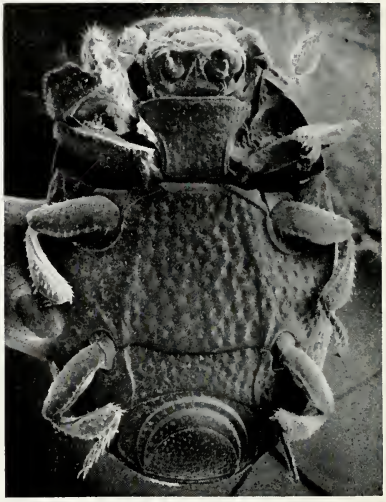
## Alan Solem



*Left:* A few of the large rod-like setae and fine hairs on the edge of a fly's wing, 2,175 times life-size. *Right:* Drawing of *Musca domestica*, the common housefly, 13 times life-size. Small boxes over parts of eye, wing, tongue, foot, and halter (a balancing organism located underneath wing) show where scanning electron microscope was focused to obtain pictures reproduced in this article and on cover.

A 1/30-inch-long beetle seen through an optical microscope.

Same kind of beetle seen through a scanning electron microscope.



microscope, and the TEM compares with the compound microscope.

For many scientists, their first use of the SEM in research ranks as one of the greatest thrills of their lives. Scientists continually bump up against limits in their work. The needed specimens aren't available, or the details just aren't quite visible with their optical microscopes. The SEM removes this second problem completely.

My own feelings on first using the SEM were chronicled in an earlier *Bulletin* (March 1969). During the preparation of "Below Man's Vision" I had the chance to help several colleagues go through similar experiences. For the past two years, the American Dental Association Research Institute (ADARI) and Field Museum of Natural History have had a cooperative research project on feeding mechanisms and tooth structures in primitive organisms. Studies of fish teeth, beetle mouth parts, and snail dentition were carried out with the invaluable aid of Dr. Harvey Lyon, Mr. John Lenke, and Mr. George Najarin of ADARI.

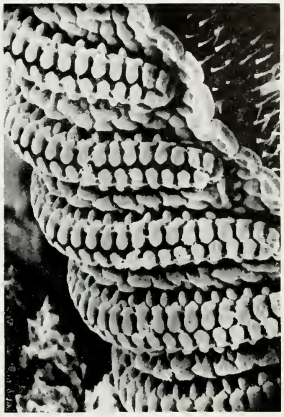
A growing flood of scientific papers in all fields began to use scanning microscope photographs. This fact, combined with my own missionary efforts, made it apparent that the Museum's research program needed such an instrument. A funding request to the National Science Foundation was approved in mid-1972, and sometime this summer a scanning electron microscope will be in operation at Field Museum. This will allow extending the very preliminary studies shown in part of the exhibit and will lead to hundreds of observations and many research publications. Nearly all the SEM photographs in "Below Man's Vision" were made especially for this exhibit or during research, with the idea of using them for both purposes.

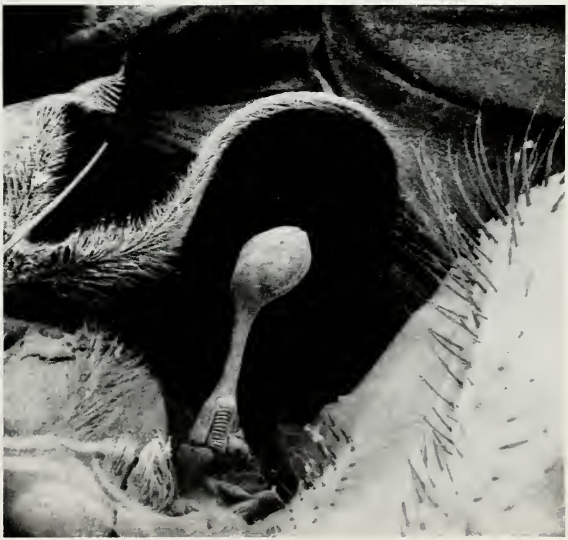
ADARI provided one part of the exhibit and allowed me to photograph a number of subjects for the section of the exhibit entitled "Unseen Worlds of the Commonplace." While the things seen by scientists in their studies may include items of beauty and strangeness, the organisms usually are unknown to our visitors. Hence a major part of preparing "Below Man's Vision" required taking common objects and well known organisms, then exploring details of their structures. In this way we hope to impress visitors with the wonders in their surroundings and to demonstrate the versatility of the scanning electron microscope.

With nearly 300 photographs displayed, it was very difficult to select appropriate pictures for this article. We could have presented an art display of spectacular photographs, but thought that it would be more meaningful to show several features of one organism.

After a bit of hesitation between a flea and a fly, the portraits of a housefly were selected.

*Top left:* The "tongue" or *oral disc* of a housefly at 92 times life-size. *Top right:* Each edge of the "tongue" has a series of projections and ridges used to soak up food. The photograph is reproduced at 805 times life-size. *Bottom:* The balancing organ (halter) of a housefly at 98 times life-size. It vibrates 200 times a second and acts as a gyroscope.





These were prepared from three different specimens collected late last summer and preserved in alcohol. One fly was given a special treatment called "critical point drying" so that details of the soft tongue and foot pads could be seen. The others were air dried and then mounted for SEM study.

The housefly, *Musca domestica*, occurs almost everywhere that man dwells. Few of us have not swatted at a fly—and missed—or been annoyed with their buzzing around our dinner, or idly speculated how they can cling to ceilings or panes of glass.

The drawing of the fly on page 3 was made from a pinned specimen, so that its legs and wings are not in a natural position. Small boxes over parts of the wing, eye, tongue, foot, and halter (a balancing organ) show where the SEM was focused in making these pictures.

Eighteenth century scientists had seen that the edge of the wing had many tiny hairs, but their structure and variety could not be appreciated. The picture at the top of page 2 shows the front edge of the wing with parts of four large *setae* (sensory organs set in sockets) and many smaller *trichia* (projections from the surface). These are sensitive to both touch and changes in air pressure.

At the top of this page are two pictures of a fly's tongue. The outer lobes are used to soak up semi-liquid or liquid food, which then is carried to the actual mouth opening. The edges of the lobes are covered with a complex set of grooves edged with blunt projections. The resulting "tire tread" pattern is highly effective in feeding. It also makes an interesting design for the artistic viewer who prefers not to think about feeding flies!

A peculiar looking club-like structure at bottom right is the *halter*. The vast majority of insects have two pairs of wings, like butterflies, grasshoppers,

and bees. Flies are unique in that they have only a single pair of functioning wings. Apparently each of the two halters is the remnant of former rear wings. The halter is a gyroscope or balancing organ that vibrates 160-210 times each second while the fly is in flight. Its club-like head is covered with tiny hairs, and the slits near its base are part of the halter's chordotonal organ, a sensory device common in insects.

Equally remarkable is the complexity of a fly's foot. The three photographs on these pages show the versatility of the SEM in seeing finer and finer details as a specimen is studied. The lower left photograph shows the whole foot in front view. For technical reasons, the leg had to be removed from the preserved specimen, then embedded in rubber cement. The cracks and creases in the background are in the rubber cement. A look at the foot shows two large claws, used for gripping rough surfaces, a long sensory "hair" in the middle of the lower side, and two large pads that extend laterally underneath each claw.

The pad on the left has a piece of dirt stuck to it. These pads enable a fly to settle on a smooth ceiling or a window. The pads are called *pulvilli* and are covered with rows of projections called *tenant hairs*.

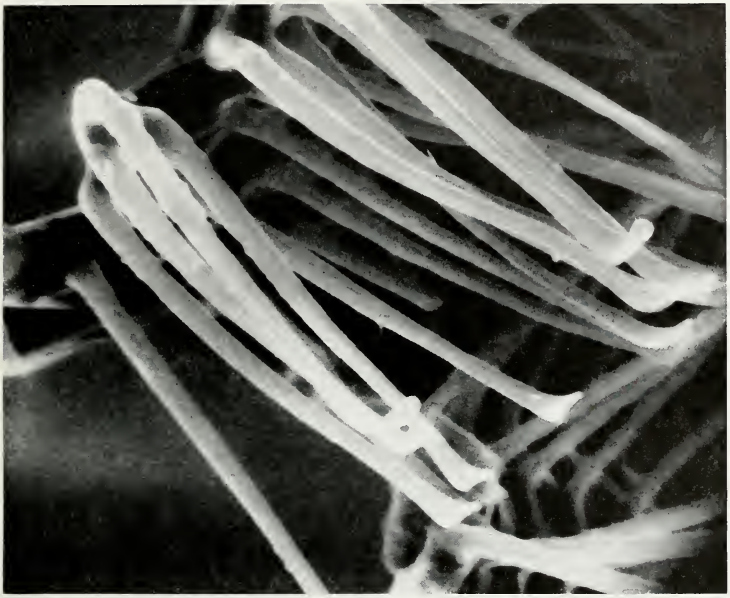
Seen at intermediate magnification in the middle picture, a pulvillus shows how the tenant hairs sit in regular rows. The critical point drying technique let me see these in extended position. If the fly had been allowed to shrivel and dry out slowly, these hairs would have been distorted. Far less information would have been available from the specimen.

When viewed at high magnification (the largest picture), the reflexed tips of individual hairs are clearly visible. Some sticky substance is secreted by these hairs onto the tips. It is the adhesive power of these hundreds upon hundreds of individual hairs that holds the fly to a smooth surface. Often it will be a combination of gripping with the claws and partial use of these adhesive hairs, but on very smooth surfaces the hairs are indispensible.

Flight, feeding, and holding onto surfaces are only samples of the fly's versatility. In our exhibit we also look at an organ called the *arista*. This feathery, short, branched organ on each side of the head permits the fly to escape a swatting hand. Air pressure in front of the descending hand warns the fly in advance of the blow.

The cover of this issue shows a small portion of a fly's eye at 7,550 times life-size. Each "eye" of a fly has about 4,000 separate facets that form images separately. A few of these are shown

*Left:* The foot of a housefly at 250 times life-size. *Above:* One of the pads on the underside of a fly's foot at 825 times life-size. *Right:* These hairs on the fly's foot secrete a sticky substance that enables the fly to cling to smooth surfaces. They are shown at 7,750 times life-size.



on the cover. Bits of dirt from the polluted air of Chicago became attached to the surface while the eye was being mounted for study. In life the surface probably would be very much cleaner.

Similar peeks at a flea, snail teeth, Queen Anne's Lace, pollen grains, the adult "chigger," and even a piece of paper very similar to that used in this *Bulletin* are among the variety of objects and organisms examined in "Below Man's Vision."

The idea for this exhibit came out of my experiences with the scanning electron microscope during the past few years. In the process of preparing the grant proposal for establishing a scanning microscope laboratory at Field Museum, research proposals by other staff members suggested many possibilities for use in an exhibit. Hence the idea of "Below Man's Vision" gradually developed and was expanded into its present form. Support received from Kent-Cambridge Scientific Instrument Co. and Cambridge Scientific Instruments Ltd., plus the cooperation of ADARI and its staff, have made this project possible.

In years to come the scanning microscope will be as well known as is the optical microscope. The latter has been used by thousands of scientists since the mid-1600s. In all this time, the world opened by its extension of man's vision has been only partly explored. Optical microscopes will continue to be used by scientists in research, by workers in industry, by students in classrooms. But the scanning electron microscope has opened up a world for investigation that is just as large, just as marvelous, and just as unexplored. The first microscopists in the Netherlands and England explored with verve and joy the new world they entered.

Scientists today are using the scanning electron microscope with the same sense of anticipation and pleasure. While a few scanning microscope photographs now appear in popular magazines and even newspapers, the potential of the SEM and the significance of its advantages are little known. As both an illustration tool and a means of seeing whole rough-surfaced objects, it has added a new dimension to low magnification studies. As a means of seeing details that were below the level of optical microscopy, it has opened a new world.

"Below Man's Vision" lets you accompany some of Field Museum's staff into an uncharted world of detail. We hope you enjoy your visit as much as we are enjoying our explorations with the scanning electron microscope.

*Dr. Alan Solem is Curator, Division of Invertebrates, Field Museum.*

Edward J. Olsen

# The most stupendous earthquake of them all

It has been called the most stupendous earthquake in the recorded history of the North American continent. It began in the early hours of December 16, 1811, in and around the small settler's community of New Madrid, in the far southeastern corner or Missouri. About 2 a.m. a series of creaks and rumblings were felt in a gradually increasing crescendo. House timbers cracked and walls broke away from each other; furniture tumbled around and shelves were emptied onto floors. Sharp shock waves shattered the area at short intervals. Houses tottered and chimneys fell. By dawn all the inhabitants stood out in the cold morning air, away from their houses.

Heavy shocks were repeated and earth waves were seen to roll across the landscape, lifting and lowering everything as they passed, like long low swells seen on the open ocean. Trees swung back and forth as the waves passed under them, frequently locking together their branches as they tipped toward each other, and ripping themselves apart as they then tilted the other way. Landslides broke loose on steeper slopes and poured into adjacent valleys. Ground water, disrupted from its normal flow patterns, popped up as instant springs in unlikely places and filled low-lying areas. Some large areas sank several feet while others were bucked upward into small impromptu hills. Along the adjacent Mississippi River, high banks slumped into the water, carrying away trees and creating huge waves that smashed the opposite shore, destroying more trees and swamping boats in their path. Small islands sank out of sight under the roiled waters.

On land, long fissures—600 to 700 feet wide, 20 feet deep, and up to several miles long—suddenly opened in the soil, some people tumbling in, to be rescued with difficulty. Sand geysers 10 to 100 feet across formed as the churning dirt ejected underlying sands and sulfurous decaying organic matter.

The rumblings continued, but no more sharp shocks were experienced—until January 23rd, over a month later, when a new shock hit the area, fully as intense as those in December. Then all became relatively quiet—until February 7th, when a series of shocks repeated all the former destruction with, some thought, greater intensity than the earlier episodes. The rumblings and aftershocks continued at moderate intensities for days, gradually fading, but not ceasing. Distinct aftershocks, almost 2,000 of them, were felt for over a period of a year, and minor ones up to two years later!

As far as any historical records show there has never been another earthquake of such magnitude and duration on the North American continent. Compared to large earthquakes elsewhere in the world, it was certainly on a par with the devastating ones in Shensi, China in 1556 and the Tokyo quake of 1923.

The damage created by the New Madrid earthquakes was large in terms of the natural environment. Approximately 150,000 acres of forests were destroyed. Two lakes were

created as land sank and filled with inrushing river and ground water: Reelfoot Lake, 18 miles long and 3 miles wide, and Lake St. Francis, 40 miles long and half a mile wide. Certainly thousands of animals were drowned by these sudden inundations. In terms of the settlers, however, losses were small. In the 1811-1813 period the population of the region was still low. Many of the dwellings were log cabins, which became disjointed by the shock waves, but did not always tumble. Only one person was known to have been killed in a falling building. An unknown small number drowned when river banks caved in and when boats were swamped by churned river waters.

Although the town was damaged badly enough that the site had to be abandoned, it was not a major catastrophe *at that time*. Perhaps of greater significance is the damage suffered in other, more populous areas, and the great distances at which the shocks were felt. About 50,000 square miles were hit the hardest—which means that points up to 130 miles from New Madrid could have suffered severe damage had there been any great population centers within that radius at the time. St. Louis lay just beyond this range. It was then still a small trading town and suffered mainly from fallen chimneys and cracked walls. Farther afield, chimneys also tumbled in Cincinnati, Ohio, 350 miles away!

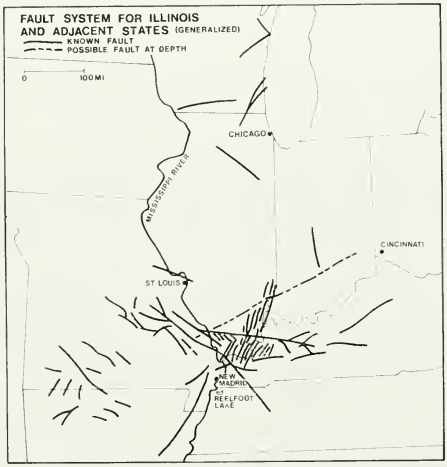
Along the river below Vicksburg, Mississippi, 300 miles to the south, river banks caved in. In Charleston, South Carolina, 650 miles away, some buildings were cracked and chimneys fell, and Washington, D.C., 700 miles away, was severely shaken! Noticeable tremors were felt in Baltimore, Maryland, 750 miles away, and in Boston, Massachusetts, 1,100 miles away! Weak vibrations were also felt in Montreal, along the Gulf coast at New Orleans, and northwestward along the upper reaches of the Missouri River. All in all, an area approximately 2,500 miles in diameter, centered on southeastern Missouri, was affected to varying degrees depending on local geological substructures.

# *created this lake...*

**Cypress along the shore of Reelfoot Lake in northwestern Tennessee.**
**Photo courtesy of Tennessee Department of Conservation.**

A sobering question arises. What if we were to see a repeat performance in that area today?

Although the western portion of California is much publicized as a high earthquake area, mid-westerners are probably not aware that a region that registers a high frequency of weak to moderate earthquakes includes southeastern Missouri, western Tennessee and Kentucky, southern Illinois, and northeastern Arkansas. The map here shows, in a much generalized way, the main zones of




faults (breaks in the bedrock) along which earthquakes occur. The most significant feature is that there are so many intersecting faults. This is especially dangerous, for quake movement on one fault can initiate movement on others, compounding the shock effects.

Chicago lies a bare 350 miles from this region. Within the past four years, tremors from two earthquakes have been felt here. The one September 15, 1972 originated near Amboy in northern Illinois. The other, a moderate strength quake November 9, 1968, was centered over 300 miles south of Chicago near McLeansboro. A series of strong quakes from southern Illinois or southeastern Missouri could have damaging effects on so populous an area as Chicago. This city was not built with earthquakes in mind.

Large portions of the Chicago area consist of landfill, covering old swamps and glacial lakebeds that dotted the region before the city existed. Virtually all of the smaller business and residential buildings are constructed on this landfill or on soil. Even some of the taller buildings are not built on piles that go down to bedrock, but rather "float" on caissons sunk into the glacial sands and clays that overlie bedrock to an average thickness of seventy feet. It has been observed in other regions—as for example during the medium-strength earthquake in the St. Lawrence Valley February 28, 1925—that buildings constructed on soil or landfill suffered more damage than ones built on bedrock.

There is, of course, no way to predict the effect on Chicago. It would depend on the magnitudes of the shocks and the spacing between them.

Nevertheless, a repeat of the New Madrid episode, which was capable of causing damage in Cincinnati, Ohio, and as far away as South Carolina, would not leave Chicago unaffected. Closer cities, such as St. Louis and Memphis, would suffer major destructive effects.

The geologic substructure of the western California region is pretty well understood, and we know with certainty that a major earthquake will devastate some portion of California in the near future. A great deal of current research in the discipline called *geophysics* is focused on measuring and gauging fault movement activity in California, hopefully to provide a means to predict the time of the next major quake, and minimize the loss of life that will occur.

Far less is known about the midwestern region. Yet midwesterners cannot indulge themselves in a feeling of complacence with respect to their less fortunate California cousins. No major quakes have occurred in the midwest since the area has been built up. There is no reason to believe that a repeat of the magnitude of the 1811-1813 earthquakes will ever occur again—nor any reason to believe it will not!

*Dr. Edward J. Olsen is Curator of Mineralogy, Department of Geology, Field Museum.*

# THISMIA

LOUIS O. WILLIAMS

*Above:* A specimen of *Thismia americana* collected in liquid by Dr. Norma A. Pfieffer about 1912 and presented to Field Museum in 1972, along with its original storage container. *Left:* Enlarged drawings from specimen. Entire plant is at right; its stem-like structure lies below ground surface, with only the flowers above ground. In circle is a flower dissected to show the six tepals and six stamens with the short pistil at the base, plus one stamen drawn to show anthers on the inner face. Below at left is a flower as seen from above, the tepals spread to show the ring (annulus) formed by the base of the filaments.

Sixty years ago, in what were then prairies near Chicago, now a suburban area, one of the most curious plants of the world was first discovered by Norma E. Pfieffer when she was a student at the University of Chicago. It excited the curiosity of botanists around the world and has been an enigma to Chicago's professional and amateur botanists ever since.

The reason is that the plant—*Thismia americana* it was named—belongs to the family Burmanniaceae, which is almost entirely tropical. There are about 125 species, found principally in the tropics of the world. Three or four kinds reach barely into temperate regions. Even today, *Thismia americana* is known from only about a dozen collections, made over a period of six years by Dr. Pfieffer.

*Thismia americana* is a tiny plant. The part above ground, the flower, is barely ½ inch long. It is a saprophyte living from decaying plant material.

The nearest relative to Chicagoland's own thismia is *Thismia rodwayi,* a plant known only from Tasmania and North Island of New Zealand. Dr. Fredrik Pieter Jonker, who described the Burmanniaceae family in a monograph in 1938, speculated that the two species are closely related: "It is very desirable that *T. americana* will be again collected, no American species of this affinity is known. The differences with *T. rodwayi* are very small, by examining more material it will appear perhaps that the two species are identical. It is hard to believe that Chicago is the normal area for this species, but I cannot give a satisfactory explanation why it occurs there."

How did a plant of tropical affinities get into the prairie near Chicago? It was not a fluke, for the plant is known to have been present for at least six years where it was originally found, so it withstood the cold winters.

How to account for two closely related species at nearly opposite poles on the earth? I have no theory. It is possible that our *Thismia americana* was or perhaps still is widespread on the prairies and similar ecological areas and that someday an astute collector may find this tiny little plant again.

We have in our collection what we assume is the type specimen, carefully preserved in liquid. Dr. Pfeiffer did not specify in her publication where the type was deposited. We have exhibited that specimen on Members' Nights along with a part of the story about it, so perhaps you have seen the plant I write about, one of the rarest in the world.

Recently we received a letter from Dr. Pfeiffer saying: "There are still in my possession bits and pieces of the Burmanniaceous *Thismia americana* which I found in the Chicago area years ago." Would we like to have it? Would we!

A few days later Dr. Pfeiffer, now a spry octogenarian, came in with a carton and two old coffee cans containing the research material that had been the basis for her studies published in the *Botanical Gazette* in 1914. Her "bits and pieces" are certainly a grand gift. They increase the known material available to researchers twentyfold!

*Dr. Louis O. Williams is Chairman of the Department of Botany, Field Museum.*

# *Printing Alexander Wilson's Copper Plates*

*Richard A. Davis*

I first visited the Field Museum Library because the Irwin Library of Butler University has been collecting early zoological prints as original source material for teaching the history of the biological sciences. The prints in the Butler Collection are engravings made for 17th and 18th century books on natural history. Such illustrations were printed separately from their textual accompaniments and were often also issued separately rather than bound into the books. Thus, separated from their contexts, in many cases there is no information identifying the works of which they were originally a part. Field Museum kindly granted me permission to use their resources to try to identify these prints.

My excitement mounted as Mr. W. Peyton Fawcett, the librarian at Field Museum, most accommodatingly brought me old masterpieces of printing from the Museum's collection of rare books. With this help I was able to find much of the information needed.

A reader's enthusiasm is very contagious to a librarian, and Mr. Fawcett responded generously with the resources of the library. He disappeared into the rare book room for several minutes and emerged carrying some flat and obviously heavy objects wrapped in brown paper. They turned out to be ten of the original engraved copper plates used to illustrate Alexander Wilson's *American Ornithology*.

Alexander Wilson, the weaver and poet from Paisley, Scotland who immigrated to America in 1794, was one of those singular men in the early history of our country whose deep appreciation of nature and latent artistic talents bloomed in the unexplored vastness of the New World.

Wilson's pioneer work, which paved the way for Audubon, stands as a unique and monumental achievement. In fact, nothing like it in any branch of science had appeared in America up to that time.

Wilson wrote in his Introduction in Volume I of *American Ornithology:* "As to the nature of the work, it is intended to comprehend a description and representation of every species of our native birds, from the shores of St. Laurence to the mouths of the Mississippi, and from the Atlantic ocean to the interior of Louisiana; these will be engraved in a style superior to any thing of the kind hitherto published; and colored from nature with the most scrupulous adherence to the true tints of the original. . . . It is also my design to enter more largely than usual into the manners and disposition of each respective species; to become, as it were, their faithful biographer, and to delineate their various peculiarities, in character, song, building, economy, etc. as far as my own observations have extended, or the kindness of others may furnish me with materials."

Two people who had befriended and then encouraged Wilson in this work which was to occupy him for the rest of his life were William Bartram and Alexander Lawson. Bartram, the son of the first native American botanist, John Bartram, became renowned as a naturalist and nature artist and the author of a book (*Travels,* 1791) which influenced English romanticism. Lawson was a well known engraver and did 51 of the 76 plates that the completed nine-volume *Ornithology* contained. He has been described as "Wilson's chief reliance, since he worked with equal fidelity and facility from the finished drawing or from mere outlines and the actual specimen." And, "in time of stress he was a most efficient and faithful friend of Wilson."

Under the imprint of Bradford and Inskeep, Philadelphia, in 1808 appeared Wilson's first volume of the projected ten volumes of *American Ornithology: or, The Natural History of the Birds of the United States: Illustrated with Plates Engraved and Colored from Original drawings taken from Nature.* The publishers underwrote the cost of printing 200 copies of this first volume with the understanding that unless Wilson could secure that many subscribers for the series, at $120 a set, the project would be dropped.

Wilson solicited subscribers with his first volume in hand and also with a "direct mail advertising" brochure that was sent to 2,500 prominent people in the United States. It included a colored plate to show the quality of the work. The names of 450 original subscribers were listed in the last volume.

**Plate 55 in Alexander Wilson's *American Ornithology*, "drawn from nature by A. Wilson," engraved by J. G. Warnicke.**

1 _ Ring tail Eagle
2 Sea Eagle

By 1813, the year of Wilson's death, seven volumes had been published. The work was completed in two additional volumes published by George Ord from Wilson's manuscripts.

The ten Field Museum plates had been stored in the library for many years. Realizing the full historical and scientific significance of this treasure, I expressed a wish to be granted permission to take proofs from them. I had taken a Master of Fine Arts degree in printmaking at the University of Iowa several years ago, and the desire to make prints from these plates was overwhelming.

After due consideration, the Museum's administration approved the idea, and the project took place in the Print Studio at Albion College, Albion, Michigan, with the cooperation of Professor Vernon L. Bobbitt, Chairman of the Visual Arts Department, and Professor Paul Stewart, head of the Print Studio. Mr. George McCullough, painter and printmaker on the faculty of the Fort Wayne Art Institute, assisted me in the actual printing.

Author cleaning a plate.

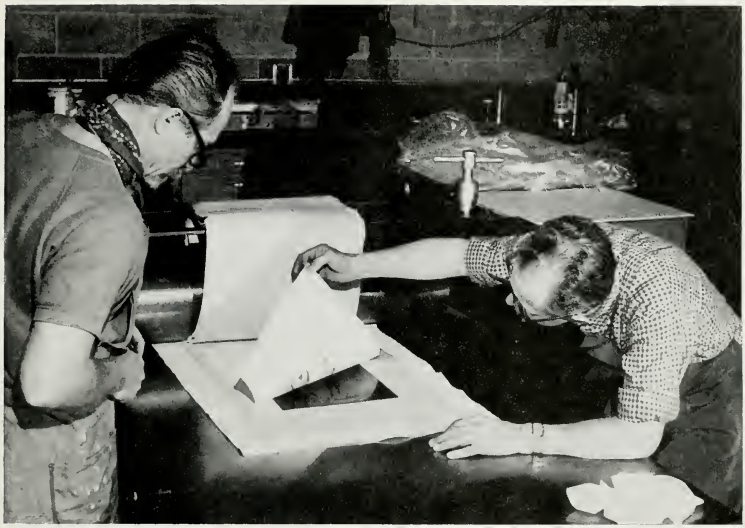
The technique of printing from intaglio plates has not changed since the 15th century. Except for a more sophisticated gearing system and the fact that early presses were made of wood instead of steel, the press used by us was essentially the same as those used in 1808.

The first step in printing each plate was to clean it with kerosene and a toothbrush to remove old ink and accumulations of grease or any other substances it had collected over the years. The cleaned plate was then placed on an electric hotplate and the ink applied to its entire surface with a felt dauber. A twisting motion was used to make sure that the engraved lines were well filled with ink.

Ordinarily an inked plate is wiped clean with a wad of tarlatan cloth and wiped again with the heel of the hand before printing. In this case, however, because some of the plates are so worn, a thin film of ink was left on the plate in order to pick up as much detail as possible. When the surface was perfectly clean, the printed result was very pale and watery with much of the delicate detailing of the feathers completely missing.

To take a proof, the paper was placed on top of the heated plate and covered with two thicknesses of felt to cushion the pressure of the rollers. I used BFK Rives paper that had been dampened several hours before. This preparation allows the paper to absorb the maximum amount of ink.

The plate was then rolled through the press, the felts pulled back, and the



After the plate is rolled through the press, the felt cushioning is pulled back and the print is carefully lifted off. Photos by Douglas R. Ensor.

print carefully lifted off the plate and studied for quality before being placed between blotters to dry.

Four proofs were pulled from each of these ten Wilson plates belonging to Field Museum (they are plates 52 through 61). One set was presented to the Museum; one to the Albion College Print Collection in commemoration of the dedication of the W. W. Whitehouse Nature Center in Albion; one for the printers; and one was added to Butler University's Irwin Library Zoological Print Collection—in which cause I had sought out the resources of the Museum's fine library and because of that "discovered" the plates.

Five of these plates were engraved by Alexander Lawson; the other five were done by J. G. Warnicke. There is a striking contrast between them. Lawson's work has been accorded much appreciation, and he has even been described as "the father of the art of engraving in this country." Nevertheless, to me, some of his plates seem stiff and artificial, the birds appearing to be stuffed toys arranged in a mere suggestion of a background. In contrast, the Warnicke plates are composed and engraved with great vigor as well as scrupulous attention to fidelity of detail—as, for instance, the one reproduced here, plate 55, showing the "Ring-tail Eagle" and "Sea Eagle."

It would be interesting to see if the differences relate to Wilson's original drawings. Wilson himself said of the relationship between his drawings and the engravings: "Every person who is acquainted with the extreme accuracy of eminent engravers, must likewise be sensible of the advantage of having the imperfections of the pencil corrected by the excellence of the graver. Every improvement of this kind the author has studiously availed himself of; and has frequently furnished the artist with the living or newly-killed subject itself to assist his ideas."

The following articles are recommended for biographical and technical information concerning Wilson and the printing and engraving of the original edition of the *American Ornithology*.

FOR FURTHER READING

Frank L. Burns. "The Mechanical Execution of Wilson's 'American Ornithology,' " *The Wilson Bulletin*, vol. 41, pp. 19-23, March 1929.

Robert Cantwell. *Alexander Wilson: Naturalist and Pioneer*. Lippincott, 1961.

Bayard H. Christy. "Alexander Lawson's Bird Engravings," *The Auk*, vol. 43, pp. 47-61, January 1926.

*Richard A. Davis is Head Librarian at Butler University in Indianapolis.*

*The copper plates, proofs pulled from them by Mr. Davis and Mr. McCullough, and a volume of the original edition of Alexander Wilson's* American Ornithology, *for which the plates were engraved, are on display in Field Museum's South Lounge through May 31.*

**Gifts from Women's Committee for Capital Campaign Nearing $1 Million**

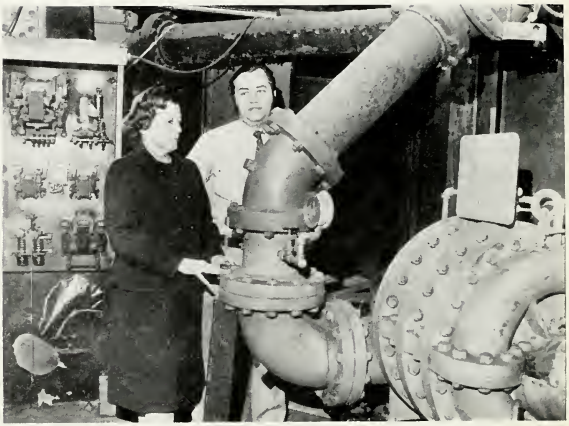
The spirit of Field Museum's "Age of Renovation" is contagious. Many new people in private and public life are daily joining the push toward the $25 million goal of the Museum's Capital Campaign.

The Museum's Women's Board, in a significant departure from its stated purpose when it was formed in 1966, has decided that its intangible support is no longer enough during this period of great need for renovation of the Museum's physical plant. As announced in last December's *Bulletin*, it has formed the Women's Committee for the Capital Campaign, chaired by Mrs. Corwith Hamill of Wayne, Illinois.

The committee turned first to the Board's 200 members, to give them and their husbands the opportunity to join in the spirit.

Charter Board Member Mrs. R. Winfield Ellis of Chicago, also a member of the Women's Committee for the Capital Campaign, points out that the raising of funds is not an official Board project, and that giving is strictly voluntary.

"We are asking members to consider whether they will get a true feeling of happiness from seeing what their gifts will make possible for the Museum," she states. "Board members are being offered the opportunity actually to see the Museum's needs and then to experience a personal joy by seeing these needs fulfilled."



Mrs. R. Winfield Ellis visits "Pump Room"—of Field Museum. Chester Grenda, Building Superintendent, shows her the fire pump which supplies water under high pressure for fire protection, installed when building was built 52 years ago. Whole system, including worn out electrical control board at left, will be replaced with a modern, larger capacity system with funds from $25 million Capital Campaign.

The response to date has been immensely gratifying. As of January 9, the committee has recorded $812,600 in gifts, including a single contribution of $365,000.

In stating her philosophy regarding her very generous gift of $100,000, Mrs. Ellis probably reflects the thinking of many contributors:

"The Museum's capital needs are quite obvious even to the casual visitor—not only to Women's Board members, trustees, and staff. My husband and I are regular attendees of the Saturday film and lecture programs and are well acquainted, therefore, with the need for renovating the Lecture Hall and the James Simpson Theatre, to cite just two examples."

Mrs. Ellis also speaks of the more personal satisfaction she expects to derive from her gift:

"I made an appointment with our lawyer, specifically to explore the advantages of making a gift to the Museum at this time. I particularly wanted to see some major project completed during my lifetime, so when he pointed out that mainly because of inheritance taxes one cannot leave all his money to heirs—whoever or whatever they may be—my husband and I saw a gift to the Museum as an opportunity for deriving not only immense personal joy, but also the satisfaction of knowing we will be helping millions of future visitors, especially children, experience a sense of wonder and delight in all that Field Museum has to offer.

"We feel that our gift will do the greatest good for the greatest number of people—now."

# CALENDAR

## Exhibits

Opens February 1

**Alexander Wilson's *American Ornithology*.** Copper-plate engravings made for *American Ornithology* (1808), a nine-volume work by the father of American ornithology, Alexander Wilson. Also shown are proofs from the plates recently pulled by Richard A. Davis, Butler University, and George McCullough, Fort Wayne Art Institute, alongside examples of first edition prints of the same engravings in Field Museum's rare book collection. Through May 31.

Opens February 14

**Below Man's Vision: Electronic Windows to Unseen Worlds,** an exhibit exploring the world of details in common objects and familiar plants and animals, and offering glimpses into current research activities. Nearly 300 photographs, displayed at up to 200,000 times life-size, introduce a previously unseen world. Through July 15. Hall 18.

Continuing

**Greenland: Arctic Denmark,** a major exhibition covering all aspects of the history and culture of the world's largest island. The extensive collection of archaeological and ethnological material is supplemented by photographs and a daily film program to illustrate various areas of economic development and social change in modern Greenland. The exhibition is sponsored by the Royal Danish Embassy and is shown under the auspices of the Smithsonian Institution Traveling Exhibition Service. Through March 8. Hall 27.

**A New Spirit in Search of the Past:** Archaeology and Ecology in the Lower Illinois River Valley, an exhibit explaining the "new" archaeology as reflected in the Illinois Valley Archaeological Program's excavation of the Koster Site, directed by Dr. Stuart Struever of Northwestern University. Through March 25. Hall 9.

**Color in Nature,** an exhibit examining the nature and variety of color in the physical and living world and how it functions in plants and animals. Continues indefinitely. Hall 25.

**Field Museum's 75th Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Film Program

A series of films relating to the "Greenland: Arctic Denmark" exhibit is shown daily beginning at the following times:

Monday-Thursday: 10 a.m. and 1 p.m.
Friday: 10 a.m., 1 p.m., and 6 p.m.
Saturday and Sunday: 11 a.m. and 2 p.m.

Sunday, February 4

**"The Land No One Wanted,"** wildlife film narrated by Buzz Moss, offered by the Illinois Audubon Society at 2:30 p.m. in the James Simpson Theatre.

Sunday, February 11 and 18

**The 28th Chicago International Exhibition of Nature Photography** projects winning and accepted transparency materials at 2:30 p.m. in the James Simpson Theatre.

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**February Hours**

9 a.m. to 4 p.m. Monday through Thursday; 9 a.m. to 9 p.m. Friday; 9 a.m. to 5 p.m. Saturday and Sunday and February 12 (Lincoln's Birthday) and February 19 (Washington's Birthday).

The Museum Library is open 9 a.m. to 4 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

## Children's Program

Through February 28

**Winter Journey for Children,** "Dog Meets Man," a free self-guided tour exploring the many aspects of man's partnership with his "best friend" since prehistoric times. Youngsters are provided with a questionnaire which routes them through Museum exhibit areas. All boys and girls who can read and write may join in the activity. Journey sheets are available at Museum entrances.

## Meetings

**February 8:** 8 p.m., Chicago Mountaineering Club

**February 11:** 2 p.m., Chicago Shell Club

**February 13:** 8 p.m., Chicagoland Glider Council

## Coming in March

Begins March 1

**Spring Journey for Children,** "Life in the Tropical Rain Forest," a self-guided tour which encourages youngsters to learn about the inhabitants of the little-known Amazonian region of South America by exploring Museum exhibit areas. Through May 31.

**Ayer Adult Film Lecture Series,** 2:30 p.m. Saturdays in the James Simpson Theatre.

March 3: **"Golden Kingdoms of the Orient,"** narrated by John Nicholls Booth.

March 10: **"Exotic West Pakistan,"** narrated by Renee Taylor.

March 17: **"The New Alaska,"** narrated by Leo and Dorothy Eckman.

March 24: **"All Around Australia,"** narrated by Edgar T. Jones.

March 31: **"Yugoslavia,"** narrated by Frank Klicar.

Volume 44, Number 3
March 1973

# Field Museum of Natural History Bulletin

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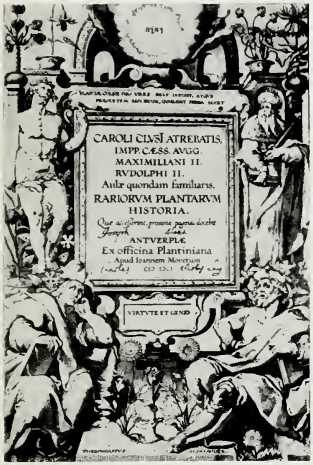


Cover tulips are from an engraving in this 1601 volume in Field Museum's rare book collection.

**2 When Tulips Were Securities**
Max Plaut
the 17th century tulipomania in Holland viewed from a new perspective

**8 International Nature Photography Exhibition**
William Burger
some pictures selected from the over 3,000 submitted

**12 The Coto Doñana**
Barbara Brown
a vignette of this important European nature reserve

**14 Capital Campaign**
the Kresge Foundation pledges $1 million to Field Museum

**15 Field Briefs**

**16 Letters**

**Calendar**

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# When Tulips were Securities

Max Plaut

Luxurious man, to bring his vice in use,
Did after him the world seduce,
And from the fields the flowers and plants allure,
Where Nature was most plain and pure.

With strange perfumes he did the roses taint;
And flowers themselves were taught to paint.
The tulip white did for complexion seek,
And learned to interline its cheek;
Its onion root they then so high did hold,
That one was for a meadow sold:

"The Mower, against Gardens," *Andrew Marvell*

Engravings in *Livre de Fleurs*, by Francois l'Anglois, published in Paris, 1620.
Photos courtesy of Hunt Botanical Library, Carnegie-Mellon University.

TVLIPA IACOBI BOMMI LVTEI COLORIS
COCCINEIS FLAMMIS DIVISA ET ORNATA.
TVLIPA IOANNIS DE RYC PVR
PVREI COLOR. MARGIN ALBO.

According to some accounts, the Dutch tulip speculation in the early 17th century brought the United Provinces of the Netherlands to the brink of national bankruptcy. The best-known account is a chapter in a book by Reverend Charles Mackay, *Extraordinary Popular Delusions and the Madness of Crowds,* published in 1841. Bernard Baruch cherished the book as a classic of stock market psychology, and thanks to his interest it was reprinted in recent years.

But too often the Tulipomania story is retold as a mere anecdote of human cupidity. Now, thanks to research since 1841, the story can be placed in historical context. As a result, we can begin to appreciate how important the preoccupation with this flower has been in the making of modern Western society.

According to Wilfrid Blunt, no classical author mentions a flower which can with any degree of probability be identified with the tulip; and no Western painting, pottery, or textile earlier than the end of the 16th century shows it. It has a much longer history in the East, and figures in religious cults from Turkey to Japan.

Its spectacular entry into the gardens of Western Europe began in 1554. In that year the Flemish scholar Ogier Ghislain de Busbecq reported tulips cultivated by Turks near Adrianople. He was at the time ambassador to Suleyman the Magnificent from Ferdinand I (who then, before he became Holy Roman Emperor, was regent for the Empire when Charles V was in Spain). Busbecq's interpreter compared the shape of the petals to a turban (*dulban* in Turkish), and from this comparison the various forms of the name *tulip* in Western languages are derived. Although tulips may have been observed some years earlier by a French traveler to the Levant, Pierre Belon, his description makes the identification doubtful.

Busbecq returned to Prague with seeds, perhaps also with bulbs. And then, in 1561, appeared the first description and illustration of a tulip published in Europe, by Konrad Gesner, naturalist, bibliographer, and town physician of Zurich, in his work *De Hortis Germaniae*. A cargo of bulbs from Constantinople that arrived in Antwerp in 1562 marked the beginning of a new horticultural industry. By 1565 they were being cultivated in Augsburg in the garden of one of the Fuggers, that great merchant-banker family. In 1576 the first monograph on garden tulips was published, by Charles de l'Ecluse. His name appears as Caroli Clusi on the title page of his 1601 book *Rariorum plantarum historia*, a copy of which is in Field Museum's rare book collection. The cover of this *Bulletin* is derived from one of his drawings in that book.

New varieties were soon bred from the 1562 cargo, especially in Holland at Haarlem and Alkmaar, which became pre-eminent centers of tulip cultivation. Demand exceeded supply, and plant breeding was profitable. Beautiful new varieties brought high prices. There are reports of a single tulip bulb being traded for a brewery, for a grist mill, or making a rich bride's dowry (the last a detail that Alexander Dumas adapted for a poor bride in his 1850 novel *The Black Tulip).*

Later, people began to speculate in tulips, before there was a stock exchange or commodity exchange or futures market, and before Europeans speculated in South Sea islands or Mississippi real estate. In fact, tulips came to play a role in the rise of modern science and in the emergence of modern social, economic, and legal life. Our story, therefore, will take us from the horticultural and botanical realm into law and economics, but first we shall interpose some background of that age.

The frenzied speculation in tulip bulbs would clearly have been impossible had there not been a genuine widespread interest in gardening. But during the Middle Ages, and even into the 16th century, gardens enjoyed an ambivalent position. The two described in Spenser's *Faerie Queene*, the Garden of Adonis and the Bower of Bliss, are at times condemned as too seductive because of their appeal to the senses (all five!) and at times favored as reminiscent of Eden and a place of innocent delight. But by the 17th century gardens had won acceptance simply as pleasant places. Bacon wrote about the delights of gardens, and Rubens painted his second wife in her new tulip garden. In 1626 the Jardin du Roi—forerunner of the Musée nationale de l'histoire naturelle—was founded. In 1656 the Lutheran German hymn-writer Paul Gerhardt gave thanks for summer in the words (translated by Margarete Munsterberg):

> The trees with spreading leaves are blessed,
> The earth her dusty rind has dressed
> In green so young and tender.
> Narcissus and the tulip fair
> Are clothed in raiment far more rare
> Than Solomon in splendor.

As God's creation, the natural world is a cause for joy, the tulip along with the narcissus especially so. And, as if philosophic justification were needed, gardens came to be considered the best place for contemplation—an idea expressed by Marvell in his famous poem "The Garden."

Until the Reformation period, botany was considered part of medicine, of *materia medica*, and flowers were thought to heal by virtue of their occult meaning. The medicinal garden was successor of the monastery garden. It became the botanical garden at the university, beginning with Padua in 1543 and then Leyden in 1577, which was where l'Ecluse was professor of botany when he published the 1601 volume mentioned earlier. With the arrival of the telescope and the microscope, plants became a major object of the measuring, counting, differentiating, and cataloging mind. Scientists were universal scholars then, not specialists, and scientific—especially botanical—collecting became part of the high culture of the great and fashionable. To be a gentleman one had to be concerned with botanical problems. Frankfort on the Main, the city of the book fair, added a flower market where the latest acquisitions were exchanged with learned enthusiasm.

One of the villainies prompted by jealousy in Dumas' *Black Tulip*—tying two cats together and tossing them into a tulip garden in order to destroy it—may have been suggested by an incident suffered by l'Ecluse at Leyden. He is said to have conducted his studies of the tulip in great secrecy, which led to a raid on his bulb garden, ruining it and breaking his heart. In any event, though the book is set in a somewhat later period (1672-73), it captures the spirit of the earlier half of the century in the reflection of its tulip-breeder hero that a man of competence seeks immortality by giving his name to a child, a book, or a flower.

Some writers have wondered that tulip cultivation and Tulipomania should have taken place in the Netherlands. It is surprising that the moist climate and the level land near Haarlem turned out to be so ideal for growing a plant whose wild ancestors are believed to have originated in the very different habitat southeast of the Black Sea and the Caspian. In other areas of Europe

*Photo opposite:* The folly of the tulip trade in Holland caricatured in a black chalk drawing by Pieter Nolpe (b. ca. 1613, d. ca. 1652). Inside the large fool's cap are a number of men sitting at tables negotiating tulip contracts; one man is holding a pair of scales. Behind the cap to the left Flora is riding on an ass accompanied by a group of people; two are striking her with rods. In the right foreground a man is wheeling a barrow full of bulbs and blossoms toward a muck pile. In the right middleground the devil is holding an hourglass in one hand and a long staff in the other, a fool's cap on its end and bills of sale hanging from it. The laughing man next to him is supposed to be a landlord who has done well. Photo courtesy of Epstein Archive, University of Chicago.

where a rising middle class might have grown—and speculated in—tulips, there was war or, as in Catalonia, great political turmoil. Stephen Usherwood, a British writer, sees the Tulipomania as a crowd reaction of relief after the victories of Gustavus Adolphus had rescued the Dutch from being hemmed in by the Catholic Imperial forces to the south and east.

As the two l'Anglois engravings suggest, the tulip had become a costly fashion flower by 1610, first in France and very soon in the rest of western Europe. At that time some growers accidentally produced bulbs with swirly yellow and white stripes. This effect is now known to be due to a virus disease transmitted by aphids but then was considered to be of scientific interest. The striped tulips were also the costliest and an impetus to cultivation. Their owners reaped great profits. As the price rose more and more, people high and low came to think of them as investments. The first mention of the speculation is that of Velius in his *Chronicle of the City of Hoorn* (1633).

By 1634, the passion for tulips had caught all social classes of the Netherlands. Everyone who owned a few square yards of land grew bulbs. Before long the bulbs were bought not so much with the aim of cultivating them or displaying them in bloom, but for resale at a profit, and this trade became the full-time occupation of many. Large fortunes, some old, some newly made in the spice trade, were invested in tulips. Thousands of people mortgaged their possessions to buy bulbs.

There also were many who scoffed at the speculation, among them writers and artists. Steven Teunisz van der Lust wrote a long poem enumerating the occupations of those engaged in tulip trading: nobles, seamen, peat diggers, vintners, masons, court criers, and so forth—at least ninety occupations. It also describes their religious range: "Arminians [i.e., Remonstrants], Geuses, Papists, Freethinkers, Lutherans, Mennonites, the devout and the indifferent."

Of any man who spent his time dealing in tulips it was said, "He is in the *Kap*" (capuche or hood), and he was called a Kappist. The significance of the term is illustrated by Pieter Nolpe's satirical picture "Flora's Foolscap, or illustration of the marvelous year of 1637 when one fool outdid the other." Jan Bruegel the Younger painted a picture entitled "Persiflage of the tulip trade: monkeys trading in tulips."

A Dutch sail carriage carrying the tulipomaniacs, who are wearing fool's caps on their heads. Flora, the goddess of horticulture, has tulips in her hands. Copper engraving, 1650. Photo courtesy of the Bettmann Archive, Inc.

In a book of the time, *The Dialogue between Waermondt and Gaergodt,* who are two weavers, Gaergodt offers to set Waermondt up in the tulip business. He will sell him a bulb, guarantee him a profit, and show him how to find a tavern in which a tulip-trading club operates—there was one in most Dutch towns. Waermondt is to ask for florists and will be admitted to their club room. "Because you are a stranger some will quack like a duck; others will say, 'I spy a stranger!' But do not take any notice. Your name will be written on a slate . . ."

Records of tulip sales and barters are a mine of information to economic historians. Tulip bulbs were traded by variety and weight; the weight unit was .05 grams. A 200-unit (⅓ ounce) bulb of the most precious variety, *Semper Augustus,* sold as high as 5,500 florins (it was one of the striped variants mentioned earlier); there were only two bulbs and they were frequently traded. Barter records list as a few of the items going in trade for a single bulb: a silver goblet at 60 fl., a fine suit of clothes at 80 fl., 12 fat sheep at 10 fl. each, and a ton of cheese at 240 fl. But the main significance of such records is that they are the first "paper transactions," well before the first stock exchange or commodity exchange was established.

Tulip prices always rose—until February 3, 1637, when a purchaser offered only 1,000 fl. for a bulb for which the vendor had paid 1,250 fl. News of this quickly spread through the United Provinces, creating panic in its wake. The would-be sellers attempted to restore confidence by holding mock auctions, but, with the market suddenly gone, to no avail. They then formed a nation-wide association and elected delegates to an assembly that was to convene in Amsterdam February 27. A majority of this assembly proposed that all contracts made before November 30, 1636 were to be kept. Those made later the buyer could cancel by paying the seller ten percent of the November price. This was thought to be fair to the established traders and to penalize only the late-comers. But the florists of Amsterdam objected, and this proposal and the assembly came to naught.

Many sellers then sued their buyers, but the courts declared the tulip contracts void. The judges are said to have considered them illicit gambling. The sellers with defaulting buyers now sought relief by petition to the Estates General of Holland and West Friesland.

They remonstrated that there was great confusion in the country, that the finding of total invalidity was intolerable in view of both the present situation and the toleration of the trade for several years. There were petitioners from all over the Netherlands, often influential nobles and burghers. The Estates General referred the matter to the Provincial Council at The Hague for investigation and report. In a short time the Council wrote an opinion which became the basis of the Act of the Estates General of April 27, 1637.

The preamble of this Act provided that there was to be no general settlement of these cases. First, the number of contracts, the name of each party to each contract, and the increase in tulip prices were to be recorded with precision. The magistrates—who were not remunerated for their services and did not have to be learned in the Roman law—were instructed to attempt to induce the parties to come to terms amicably. Where such attempts failed, they were to report to the Provincial Council and further evidence was to be sought. Meanwhile, it was left to each seller to make a formal offer of delivery of tulips to his buyer at the contracted price. Should the buyer refuse delivery, the seller could either keep them or resell them and demand any price difference from the originally contracting buyer. At that point the disputed contracts were due to be examined further as to equity. Until then, concluded the Act, the unfulfilled tulip contracts remained *in suspenso et sine praeiudicio*.

In most cases the seller had no promised bulbs to deliver, for he was in turn a buyer from some other seller. If he did, he would gain nothing from simply keeping them. If he sold at the depressed market price and sued for the difference, the courts might void the contract. Most frequently the parties lost all desire to bring their transactions to court, and the sellers accepted between five and ten percent of the contracted price in settlement.

The Act was a compromise between two conflicting interpretations of the tulip transactions under the Roman law. The first was that aleatory contracts —those in which what is to be performed is contingent upon events not within the power of the contracting parties, such as insurance, bottomry bonds (a kind of maritime lien), futures contracts, gambling—were under certain conditions legally possible. According to the other interpretation, mere paper transactions in which there was no exchange of goods or services were void in private law and not punishable. The Act of the Estates General of Holland and West Friesland favored a free and increasing commerce; it held any actual exchange of goods—but not mere speculation—to be legitimate.

It has been said that in the administration of the Roman law the judges seek to preserve contracts made—which, if defective, are to be improved according to the intention of the parties. Under Anglo-Saxon law, on the other hand, contracts are either binding as written or void because of legal defects. Rudolf Stammler in his legal analysis of the Tulipomania aftermath holds that the application of the Roman law in the 17th century was often thus defective in adjudication of cases of gambling by people of quality, but that the Estates General was legislatively and judicially wise in not legitimizing the tulip contracts, thus keeping the court dockets from being overcrowded by litigation over them.

Probably statements that the tulip craze brought Holland to the brink of national bankruptcy are exaggerations. But it did cause the ruin of several great fortunes. At that time state and economy were not so closely linked as they later came to be. The years of the Tulipomania were also the best of the brilliant and successful Stadtholdership of Prince Frederick Henry and did not take the spotlight from either Dutch participation in the Thirty Years' War—the Prince reconquered Breda in 1637 —or colonial expansion—the Dutch were then establishing themselves in parts of Brazil and in the West Indies. The East Indian islands already were in the Dutch sphere, and trade with them had enriched many Dutch and caused the inflation indicated by the tulip barter records. Finally, the Tulipomania did not keep the Dutch East India Company from beginning the conquest of Ceylon in 1638.

In fact, the most important consequences of the tulip craze were much more positive as well as long-term. The Tulipomania was the first manifestation of several modern phenomena: trade associations; middle-class gardening; adaptation of the Institutes of Justinian to emerging conditions; the mechanics of speculation in commodity futures; paper transactions; and active participation of a broad public in trade and finance.

*Max Plaut is Reference Librarian at Field Museum.*

Tulipa par. ex purpurea.

# international nature photography exhibition

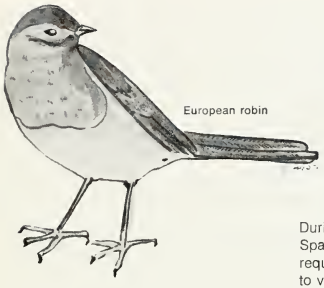
The Nature Camera Club of Chicago and Field Museum sponsored their 28th International Exhibition of Nature Photography with the public showing of about 700 slides on the 11th and 18th of February. The accepted slides were chosen from a total of over 3,000 by a panel of five judges. In this way an amateur nature photographer from anywhere in the world can see how his or her best efforts compare with the work of others. A catalog is sent to all entrants listing the accepted slides and their makers.

The catalog and careful processing of all slides are not the only services provided for entrants. Fifty slides are selected and, with the maker's permission, reproduced to make traveling sets. These fifty-slide sets are chosen to be representative of the show and are loaned to individuals and groups in distant areas who could not see the exhibition itself.

Another service is analysis of slides by those who request it after having none of their slides accepted. (Each entry is restricted to four slides.) Club members who have been photographing for many years provide these analyses. Often a beginning photographer will enter slides that are of poor quality or with obvious flaws in composition. Here commentary can be explicit and helpful. But there are times when slides that are technically and esthetically excellent have not been accepted. Here commentary is often reduced to, "Well, I guess the judges didn't like it—try again next year."

*William Burger*
*President, Nature Camera Club of Chicago*

Photos: (page 8) "Devoted Mother," by Laurie Kriz, Apache Junction, Arizona; (page 9) "Snowy Egret Alerted," by Daniel H. Lee, Rochester, New York; (page 10, top) "Polyorchis Jelly," by Mrs. Alice Kessler, Sacramento, California; (page 10, bottom) "Enhanced with Dew," by Louis R. Paxton, Zanesville, Ohio; (page 11) "Pacific Wave," by Nelson H. Martin, Santa Barbara, California.



European robin

# The Coto Doñana

Barbara Brown

During a business trip that called us to Spain, my husband Roger and I requested and were granted permission to visit the Coto Doñana, one of the most important nature reserves in Europe. More than half of all European bird species stop here during their migrations between Europe and Africa.

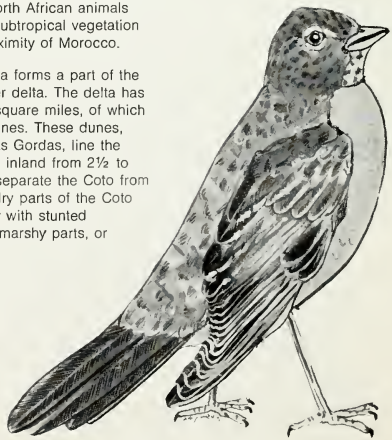
It was too early to witness the spring migrations, but even so we didn't want to miss this rare opportunity. The year-round variety of herons, ducks, larks, warblers, and particularly diurnal birds of prey is impressive. Large animals such as the imperial eagle and the Spanish lynx, now rare in other parts of Spain, live protected in the Coto. Many characteristic North African animals combined with subtropical vegetation attest to the proximity of Morocco.

The Coto Doñana forms a part of the Río Guadalquiver delta. The delta has an area of 620 square miles, of which 120 are sand dunes. These dunes, called the Arenas Gordas, line the coast, extending inland from 2½ to 7½ miles, and separate the Coto from the sea. In the dry parts of the Coto the soil is sandy with stunted vegetation. The marshy parts, or *marismas*, are flooded semi-annually by the Río Guadalquiver, leaving sticky, slimy sediments that are saline and barren.

This unique complex of habitats, one of the two main western European flyways for migrating birds, had been the private preserve of the Dukes of Medina Sidonia for five centuries. In 1964 the World Wildlife Fund in collaboration with the Spanish Scientific Council acquired about 25 square miles of the original Coto Doñana for a nature reserve. The area was then ceded to the Spanish government for control and maintenance.

The 300,000 acres of marismas adjoining the Coto are not protected, however. Projected large-scale drainage of these swamps would drastically alter the ecology of the entire region, including the parts of the marismas that extend into the Coto.

We arrived at the locked gates of the reserve in our rented car and followed



American robin (a thrush)

*Mrs. Barbara Brown is a Museum Member and has been a volunteer technical assistant in the Mammal Division for several years. She wrote to us about her visit to one of the most important nature reserves in Europe—an unguided detour off the beaten travelers' track.*

instructions given us by the authorities for locating the key. It was indeed, as described, buried in the sand under the third post. After opening the gate and driving the car through, we of course reburied the key. The journey continued over fifteen miles of washboard road across the sandy plain to what was called the Palacio.

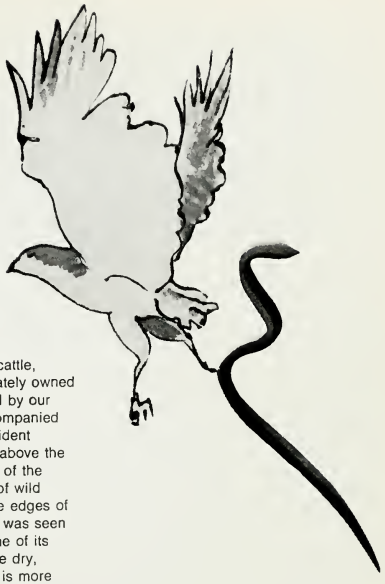
Along the way, insect-hunting kestrels filled the sky, magpies flew from one shrub to another, and lapwings strutted along the side of the road.

Martin Brandt, a young Norwegian naturalist-ranger, greeted us as we pulled into the cobbled courtyard of the Palacio. He explained that we could explore the Coto by Land Rover, but we assured him we preferred to make the excursion on foot.

The Palacio is a 300-year-old white stucco hunting lodge built in the form of a square. The walls in the entrance hall are covered with photographs of hunting parties of Spanish nobility. In the adjacent courtyard are barns, hen houses, tool sheds, and the cultivated gardens of the *guardas,* or wardens. In front is a wire enclosure with two captive ferrets, a desert fox, a few deer, and a Spanish lynx.

Many small land birds can be found in the vicinity of the Palacio, the cultivated gardens, the work buildings of the guardas, and the thickets of trees adjacent to the edge of the marismas. Stonechats, chiffchaffs, chaffinches, and serins were common. Most exciting for us, however, was the sight of a small brown bird with a bright orange-red breast, the common European robin. Now we understand why English colonists in America called our much larger thrush a robin.

We saw representatives of most of the reserve's avifauna along the grasses, sedges, and reeds bordering the edge of the marismas. Predators were soaring overhead constantly, hunting small mammals and reptiles concealed in the rushes. Fallow deer and red deer browsed nearby, and feral descendants of horses and cattle, escaped from herds on privately owned estates, grazed unconcerned by our presence. Cattle egrets accompanied the herds. Thousands of resident greylag geese filled the sky above the flooded marismas. Evidence of the nightly rooting and digging of wild boars was seen all along the edges of the marshes. A snake-eagle was seen aloft clutching a snake in one of its talons. This eagle prefers the dry, sandy areas, where its prey is more abundant. Trees along the edges of the sand provide nesting sites. Kestrels were abundant in all the habitat types we explored.



Away from the edge of the marismas is a sandy plain covered with halimium, gorse, broom, and scattered cork oaks. The several small freshwater lakes distributed over the plain are fed by a stream called Madre de las Marismas. Small islands, or *vetas,* which dot the lakes serve as breeding areas for ground-nesting birds.

The stunted vegetation and scarcity of animals on the arid plain contrast sharply with the lagoons and marshes teeming with life. Nevertheless, here in the desert and the depressions between the sand dunes is where myriads of migratory birds stop to rest. Until they come, it belongs to the great numbers of butterflies, the occasional rabbit we saw darting behind a shrub, and the red fox we glimpsed running across the plain.

Drawings by Zbigniew Jastrzebski.

## Kresge Foundation Pledges $1 Million to Capital Campaign

"One of the greatest institutions of our country."

That is how Stanley S. Kresge, chairman of the foundation established by his father, described Field Museum during a press conference February 15 to announce the foundation's $1 million pledge to the Museum's $25 million Capital Campaign.

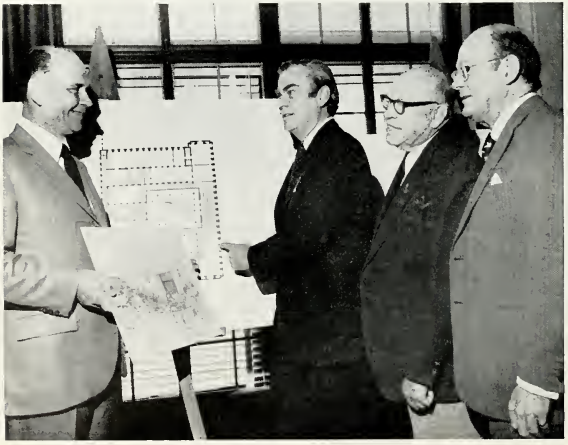
Museum Director E. Leland Webber expressed gratitude for the grant, explaining that it will be used to help build an educational center in the Museum's west wing. Included will be a bus ramp entry at ground level to serve the more than 350,000 school children who annually visit the Museum in organized groups, as well as adequate entry, orientation, checking, and restroom facilities for them. The entry will also serve visitors confined to wheelchairs or otherwise unable to climb stairs.

Dr. Alice Carnes, coordinator of teacher training at Field Museum, described how educational facilities, now scattered throughout the museum, will also be centrally located to better serve visiting school groups and teachers, community groups, college students, and persons working on specialized research.

Others participating in the press conference were William Baldwin, president of the Kresge Foundation, of Birmingham, Michigan; Blaine Yarrington, Museum trustee and chairman of the Capital Campaign's corporate and foundation division; Illinois Lieutenant Governor Neil Hartigan; and Mrs. Judith Allen, principal of Harvard-St. George's Lower School, in Chicago.

The Kresge gift brings the Museum's share of the Capital Campaign to $9.4 million, leaving $3.1 million still to be raised by the Museum before the deadline of September, 1974. This sum of $12.5 million will be matched dollar-for-dollar by the Chicago Park District through funds raised by its bonding authority, granted by the Illinois General Assembly. Lieutenant Governor Hartigan praised the matching-funds concept as exemplifying "intelligent relationship between the private sector and government."

Left to right, Blaine Yarrington and E. Leland Webber show Stanley S. Kresge and William Baldwin plans for educational center in Field Museum's west wing.



# FIELD BRIEFS

### Natural History Field Trips Offered

Three weekend natural history field trips are being offered this spring by Field Museum's Department of Education in cooperation with the University of Chicago Downtown Center. One objective of the trips is to investigate the correlation between the geology of the areas and spring flowers, especially effects of the geologic history on flowering plants. Dr. Matthew Nitecki, geologist, and Dr. William Burger, botanist, both of Field Museum, will lead the groups.

*May 5 (10:30-12 noon): Introductory lecture.*

*May 12 (8 a.m.)-May 13 (6 p.m.): Starved Rock area.* Starved Rock, a bluff cut by a glacial river and standing some 100 feet above the surrounding glaciated plain, contains a rich variety of flora characteristic of our area. Leaders: Drs. Nitecki and Burger.

*May 19 (8 a.m.)-May 20 (6 p.m.): Galena and its environs.* In the 1840s Galena was a major lead-producing district of the U.S. The area was not covered by glaciers, and therefore the landscape is much different from the flat, glaciated topography of the rest of Illinois. Leader: Dr. Nitecki.

*June 2 (8 a.m.)-June 3 (7 p.m.): Devil's Lake, Wisconsin.* The Baraboo Range supports a unique flora, some of which has apparently been undisturbed since the end of the last glaciation. The range, about one billion years old, consists of quartzite folded into vertical position. Leaders: Drs. Nitecki and Burger.

Tuition for the series is $80 ($75 for Museum Members), or $30 for each trip ($28 for Museum Members), and includes transportation on a chartered bus. Overnight accommodations are not included, but advance reservations at reasonable rates will be made for all participants. Anyone interested in joining one or more of the groups should call Mrs. Maria Matyas for further information, FI 6-8300.

### Two 30-Year-Plus Staff Members Retire

James R. Shouba joined the Museum staff in 1939. As Superintendent of Maintenance beginning in 1947 and Building Superintendent from 1962, he doctored every ailment the building, in its advancing age, succumbed to, and supervised every structural alteration required by new exhibits and changing work space needs. Once he was even called upon to dispose of the remains of a camel. But more in his line was overseeing the major construction projects of filling in two of the building's light wells in order to add 35,000 square feet of much needed working and storage space. Because of his intimate knowledge of the building's pathology, Mr. Shouba will continue to serve the Museum as a part-time consultant to help with the major renovations being made possible by funds from the Capital Campaign.

Joseph B. Krstolich and "friend" (who is now in a diorama in Hall C).

When Joseph B. Krstolich worked at Field Museum in 1939 on an art project, he was already a well known animal sculptor with 20 years of accomplishment and acclaim to his credit. He became a full-time Museum employee in 1941, and for the next 31 years, as staff artist, applied his talents to such diverse things as underwater photography of marine life off Bermuda; a model of a crocodile brain; a cat carved on a sheet of plexiglass to show its internal organs (part of our This is a Mammal exhibit); the famous gorilla Bushman (presently in the 75th Anniversary exhibit); and, most recently, the four new figures in our Neanderthal Man diorama. An uncounted number of Museum exhibits have been enhanced by Mr. Krstolich's creative skills. He can't say which he enjoyed working on most because, as he remarked, "Every exhibit was a new challenge."

James R. Shouba

### Training Program in Anthropology Offered High School Juniors

Twenty-seven high-ability high school juniors will be chosen to participate in Field Museum's Student Science Training Program in Anthropology this summer.

This intensive course offers young people an unusual opportunity to learn about the various fields of anthropology and thus test their career interest in the subject. Monday through Friday sessions, from June 25 through August 3, will feature lectures by outstanding authorities, supervised research projects, workshops, study of museum specimens, and archaeological field work at a nearby site.

The program, one of only a few of its kind in this country, is supported by a grant from the National Science Foundation. It is under the direction of Miss Harriet Smith, lecturer in anthropology in Field Museum's Department of Education.

Students interested in joining the program may obtain application forms from either high school officials or Miss Smith. Completed applications must be returned to Field Museum no later than March 26. Participants will be selected on the basis of academic achievement, recommendations of teachers, and personal interviews.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I certify that the statements made by me above are correct and complete.—*Norman W. Nelson*, Asst. Dir., Admin.

# LETTERS

*To the editor:*

The story "The Mystery of Maize" by George W. Beadle in the November 1972 issue of the *Bulletin*, about his theory that teosinte is the wild ancestor of corn, is readable and entertaining. It does, however, contain a number of errors of fact, interpretation, and omission.

At least four of my own views are misrepresented in the story. 1) In the author's so-called "cob quiz" I did not classify a single second-generation ($F_2$) cob as that of "good" corn and I have yet to see one that is. 2) My present idea that teosinte is the progeny of a corn-like ancestor is not a "dramatic reversal" but rather the result of continuing research in which I have participated with my colleagues. This work, concerned with the characteristics of the pollen grains, has provided convincing evidence that *Tripsacum* can be eliminated as one of teosinte's progenitors, leaving corn as its only ancestor. 3) There is no "curious inconsistency" in my idea that teosinte evolved from corn while doubting that cultivated corn could have evolved from teosinte. The former would have occurred over millions of years; the latter in three thousand years or less. 4)I have never described the earliest cobs from the Tehuacán Caves as "brittle," a characteristic of teosinte. Instead they are "fragile," which in proper botanical context is quite different.

The author errs, I think, in placing too much reliance on the cytogenetic evidence. This has long been accepted as showing a close relationship of corn and teosinte but it falls far short of proving that corn evolved from teosinte under domestication. His own experiments, involving 50,000 plants, have added little if anything to what was already known from the earlier studies of Collins and Kempton (1920) and Mangelsdorf and Reeves (1939). His conviction that the differences between corn and teosinte are few and are simple in their inheritance may have prevented him from seeing what these earlier workers had observed: that the differences between the two species are numerous and complex and that in their second-generation hybrids all characteristics of each parent are associated with one or more others.

The story mentions, but does not do justice to, the extensive archaeological collections of prehistoric corn that have been assembled during the past twenty-five years through the congenial and effective collaboration of botanists and archaeologists. Genetic experiments can do no more than provide a basis for speculating about the past; archaeological remains are the past. I have had the exciting and rewarding experience of analyzing, with others, the collections from fourteen once-inhabited caves in Mexico, Arizona, and New Mexico. Perhaps the most impressive feature of these collections is the consistency with which they all point to the same conclusion: the earliest corn, except for its smaller size, has all of the principal botanical characteristics of modern corn and shows no evidence of having evolved from teosinte.

Especially significant is the earliest prehistoric corn from two caves, San Marcos and Coxcatlan in the Tehuacán Valley of Mexico, excavated by Richard S. MacNeish. The earliest cobs, dated at about 5000 B.C., we regard for a number of reasons (six, not two as stated by Beadle) as those of wild corn. The resemblances that Beadle claims to see between this early corn and teosinte simply do not exist. With these comments I have included photographs of an "ear" of teosinte and a cob of the 7,000-year-old corn. The reader need not be a trained botanist to see that the two are quite distinct.

Supplementing the archaeological evidence is the paleobotanical evidence represented by fossil pollen grains of corn found in drill cores taken from a site in Mexico City in preparation for the construction of Mexico's first skyscraper.

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Please address all letters to the editor to

*Bulletin*
Field Museum of Natural History
Roosevelt Road and Lake Shore Drive
Chicago, Illinois 60605

The editors reserve the right to edit letters for length.

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*Left:* An "ear" of teosinte (actual size). Because of the hard, bony shells in which its seeds are enclosed and the tendency for the ears to fall apart before they can be harvested, teosinte has generally been considered unpromising as a food plant. *Right:* A cob of the earliest known corn (actual size) dated at 5000 B.C. from a once-inhabited cave in Mexico. Except for size, it has all of the principal characteristics of modern corn, and it shows no evidence of having evolved from teosinte. I regard it as wild corn.

These occurred at depths of more than 200 feet and are estimated to be at least 80,000 years old. They were identified by Professor Elso S. Barghoorn, one of the world's foremost paleobotanists. Beadle does not mention this critical evidence, which, if accepted, represents a fatal blow to his teosinte theory, and I find his failure to do so almost incredible. Certainly it is an essential part of the corn story. Knowing the circumstances under which the drill cores were collected and the pollen isolated and identified, I regard the fossil corn pollen as authentic and, like the prehistoric cobs of the Tehuacán Valley, showing that the ancestor of cultivated corn was corn.

*Paul C. Mangelsdorf*
*Chapel Hill, North Carolina*

*To the editor:*

Thank you for permitting me to note Professor Mangelsdorf's criticism of my November article. I am not persuaded by the objections he makes to teosinte as a direct ancestor of maize, but agree with you that an adequate response requires technical considerations and references not wholly appropriate to the *Field Museum Bulletin*. I shall therefore respond elsewhere in due course.

*George W. Beadle*
*University of Chicago*

# CALENDAR

## Exhibits

Closes March 25

**A New Spirit in Search of the Past:** Archaeology and Ecology in the Lower Illinois River Valley, an exhibit explaining the "new" archaeology as reflected in the Illinois Valley Archaeological Program's excavation of the Koster Site, directed by Dr. Stuart Struever of Northwestern University. Hall 9.

Continuing

**Below Man's Vision: Electronic Windows to Unseen Worlds,** an exhibit exploring the world of details in common objects and familiar plants and animals, and offering glimpses into current research activities. Nearly 300 photographs, displayed at up to 200,000 times life-size, introduce a previously unseen world. Through July 15. Hall 18.

**Color in Nature,** an exhibit examining the nature and variety of color in the physical and living world and how it functions in plants and animals. Continues indefinitely. Hall 25.

**Field Museum's 75th Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

**Alexander Wilson's *American Ornithology.*** Copper-plate engravings made for *American Ornithology* (1808), a nine-volume work by the father of American ornithology, Alexander Wilson. Also shown are proofs from the plates recently pulled by Richard A. Davis, Butler University, and George McCullough, Fort Wayne Art Institute, alongside examples of first edition prints of the same engravings in Field Museum's rare book collection. Through May 31. South Lounge.

## Film Program

Sunday, March 11

**"Yosemite: An Ecological Visit,"** wildlife film narrated by Eben McMillan, is offered by the Illinois Audubon Society at 2:30 p.m. in the James Simpson Theatre.

**Ayer Adult Film Lecture Series,** 2:30 p.m. Saturdays in the James Simpson Theatre.

March 3: **"Golden Kingdoms of the Orient,"** narrated by John Nicholls Booth.

March 10: **"Exotic West Pakistan,"** narrated by Renee Taylor.

March 17: **"The New Alaska,"** narrated by Leo and Dorothy Eckman.

March 24: **"All Around Australia,"** narrated by Edgar T. Jones.

March 31: **"Yugoslavia,"** narrated by Frank Klicar.

## Children's Program

Begins March 1

**Spring Journey for Children,** "Life in the Tropical Rain Forest," a self-guided tour encouraging youngsters to learn about the inhabitants of the little-known Amazonian region of South America by exploring Museum exhibit areas. Youngsters are provided with a questionnaire which routes them through Museum exhibit areas. All boys and girls who can read and write may join in the activity. Journey sheets are available at Museum entrances. Through May 31.

## Meetings

March 8: 8 p.m., Chicago Mountaineering Club

March 11: 2 p.m., Chicago Shell Club

March 13: 7:30 p.m., Nature Camera Club of Chicago

March 13: 8 p.m., Chicagoland Glider Council

March 14: 7:30 p.m., Windy City Grotto National Speleological Society

March 27: 7:30 p.m., Nature Camera Club of Chicago.

## Coming in April

**Ayer Adult Film Lecture Series,** 2:30 p.m. Saturdays in the James Simpson Theatre.

April 7: **"Michigan Odyssey,"** narrated by Edward M. Bingham, Jr.

April 14: **"Russia,"** narrated by Dr. Arthur C. Twomey.

April 21: **"Jerusalem, Jerusalem,"** narrated by Richard Linde.

April 28: **"The Open Arms of Portugal,"** narrated by James Metcalf.

**Spring Film Series for Children,** 10:30 a.m. Saturdays in the James Simpson Theatre.

April 7: Fiesta-Cub Scout Day; **"Exciting Latin America."**

April 14: Egypt, pyramids, and mummies; **"Ancient Land of the Pharoahs."**

April 28: **Museum Traveler Day;** annual presentation of Field Museum Journey awards and color film.

**March Hours**

9 a.m. to 5 p.m. Saturday through Thursday and 9 a.m. to 9 p.m. Friday.

The Museum Library is open 9 a.m. to 5 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

Volume 44, Number 4
April 1973

# Field Museum of Natural History Bulletin

**Field Museum of Natural History Bulletin**

Volume 44, Number 4
April 1973

Education is finding windows to the world; Field Museum has thousands of them. Cover photo and design by Clifford Abrams.

**2 New Directions for the Education Department**
educational programs have always been important at Field Museum; now they are expanding into new dimensions

**14 Capital Campaign**
how leadership grants are pushing it toward its goal

**15 Field Briefs**

**16 Members' Nights: The Inside Story**
a sneak preview of some of the activities planned for the annual spring open house, May 3 and 4, 6 to 10 p.m.

**Calendar**

Field Museum of Natural History
Director, E. Leland Webber

Managing Editor G. Henry Ottery; Editor Elizabeth Munger; Staff Writer Madge Jacobs; Production Russ Becker; Photography John Bayalis, Fred Huysmans.

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films
education

# New directions for the Education Department

**Editor** Mr. Matthai, last year the *Bulletin* devoted separate issues to the Museum's four scientific departments. Now we want to focus on the Education Department. Would you as Chairman of that department lead off by telling us what its role is.

**Robert Matthai** Our job is to reach out to the public—children *and* adults—and help them learn from the vast array of scientific information the Museum has "in stock," so to speak. This means selecting and organizing information. It also often means translating what is esoteric and technical into forms and activities that can be understood—and enjoyed—by people of different ages and different interests.

**Ed.** How is the Education Department related to the others in the Museum—the scientific and exhibition departments?

**Robert Matthai** They generate the information and help create background materials for us to work with. We would have nothing to purvey if there were no exhibits and no scientific staff. On the other hand, the fact that the Education Department has so many special services for students and adults does help attract public and private support necessary to pay for scientific research and new exhibits. The relationship is truly symbiotic—education, exhibition, and scientific research are intertwined in a museum like ours. Any one part would mean little without the other two. Our educational programs relate closely to exhibits; our staff help in the planning of new exhibits; and the scientific staff provide the "raw material" for our programs and help us keep them accurate.

**Ed.** Is museum education different from school education?

**Robert Matthai** The strong suit of a museum is that it offers people experience with three-dimensional "real things," not just two-dimensional representations of reality. Thus museum education stresses exposure to objects, both those that are man-made, called artifacts, and those that are made by nature, called specimens. These objects are usually intrinsically interesting to students because of their high "reality quotient."

**Ed.** Many schools are using innovative teaching techniques these days. Is museum education keeping pace?

**Robert Matthai** A major criticism leveled at museum education is that it often lags behind educational techniques current in schools. One complaint is that too many facts are crammed into a brief visit to a museum. Another is that students' exploration and curiosity are hampered by glass-covered cases or rope barriers. Museums, particularly those of the natural history variety, also often suffer from a "musty-dusty" image in many people's minds.

**Ed.** What are you doing about these criticisms? Can modern educational philosophy fit into an old and venerable institution?

**Robert Matthai** Yes indeed, educational progress and museum traditions can be compatible! For example, even though Field Museum will no doubt always have glassed-in cases, we have devised educational activities to be carried out in classrooms or learning centers, and we are doing more here in the Museum, and especially in schools, to satisfy the human need to explore and manipulate objects. To be sure, it will always be inappropriate for fragile and precious objects to be handled by children, or adults, but there are plenty of sturdy and less valuable objects that *can* be made a direct part of the educational experience. And as new exhibits are planned, there will be opportunities to make visitor participation part of the design.

Education Department staff—*Front row:* Marie Svoboda, Coordinator, Raymond Foundation; Martha Lussenhop, Instructor, Raymond Foundation; Julie Castrop, Instructor, Raymond Foundation; Priscilla Byrne, Departmental Secretary. *Back row:* Ronald Lambert, Preparator, Harris Extension; Edith Fleming, Instructor, Raymond Foundation; Nancy Simpson, Research Assistant, Teacher Training; J. L. Williams, Instructor, Outreach; Alice Carnes, Coordinator, Outreach/Teacher Training; Susan Kaye, Assistant to Chairman; Cynthia Mark, Research Assistant, Outreach/Harris Extension; Robert Matthai, Chairman; Gail Downey, Secretary, Raymond Foundation; Harriet Smith, Instructor, Raymond Foundation; James Bland, Instructor, Raymond Foundation/Outreach; David Pressler, Coordinator, Harris Extension; Carolyn Blackmon, Coordinator, Outreach/Special Educational Services. *Holding pennant:* Mary Talley, Secretary, Outreach. *Not in picture:* Barbara Young, Secretary, Raymond Foundation, and John Dykstra, Driver, Harris Extension.

Making museum teaching techniques more like methods now used in schools—or on TV, as represented by Sesame Street, for example—is a more difficult problem. But having workshops for our teaching staff, encouraging them to attend professional conferences, and offering sabbaticals can close this gap.

**Ed.** Just who are the people the Education Department serves? You mentioned children *and* adults earlier.

**Robert Matthai** Unquestionably the largest group are school-age children and young people. We serve them directly at the Museum as well as indirectly at their schools through their classroom teachers. Last year, for instance, more than 340,000 student visitors came to the Museum in organized groups—over 6,700 such groups. We were able to present a special instructional teaching program for about 20 percent of them through the Raymond Foundation division of the Education Department. Through the Harris Extension division we circulate small exhibit cases among almost 450 city schools on a rotational basis. Just a few months ago we began an ambitious project which involves taking a wide range of educational services out to communities in the Chicago area.

Then there are some special year-long course programs offered by the Chicago Board of Education which involve close cooperation and participation by the Museum. They are held right here at the Museum. One is the museology course for gifted high school students (described in the July/August 1971 *Bulletin*). Another is an anthropology course for students of the "Metro High School Without Walls." And a special art class for talented public high school students meets here on Saturdays and uses Museum exhibits and materials to learn about form and design.

Besides all these student-oriented programs, there are the film and lecture series for the general public at the Museum, and we and the University of Chicago Downtown Center co-sponsor evening and weekend non-technical courses. I want to say more about special programs for adults later when I talk about plans for the future. But first, the Education Department staff people who are designing and carrying out the programs now in progress want to describe them in some detail.

Marie Svoboda

### *Programs for school groups*

**Ed.** Let's start with the section of the department that presently serves the largest number of young people, through the programs for school groups. That's your division, Miss Svoboda. These programs have been operating for a long time haven't they? I remember special bus trips to Field Museum from my own elementary school days in the Chicago area.

**Marie Svoboda** The Museum began offering tours and workshops to the school children of Chicago in 1925, thanks to a gift from Mrs. Anna Louise Raymond. Since then the Raymond Foundation has subsidized the instruction of just under six million children.

**Ed.** Bob Matthai said that your staff offered instructional programs to about 20 percent of the some 6,700 organized groups of young people who came to the Museum last year. That's more than 1,300 groups. Who does all this?

**Marie Svoboda** Our regular staff are three full-time and two half-time instructors. They all have a master's degree in some area of natural history and are qualified to teach in other areas as well. But we also have 29 part-time specially trained volunteer instructors who help conduct tours for school groups. All these people have in common a talent for communicating effectively and spontaneously with children.

**Ed.** Would you describe these instructional programs?

**Marie Svoboda** We offer three kinds—Museum tours, study-unit programs, and workshops. You could think of them as increasingly intense exposure to the particular theme or topic each one is organized around. And of course the topics themselves as well as the teachers' presentations are offered at levels appropriate to the age of the group. Some of the most popular topics are "Indians of North America," "Dinosaurs," "Ancient Egypt," and "Animals Around the World." New programs are added whenever appropriate and where Museum exhibits and collections can be used to advantage. Some new topics added this year are "Endangered and Vanishing

Animals," "Ecology," "Monkeys and Apes," "Cultural Anthropology," and "Microscopic Life."

**Ed.** How is this instruction handled?

**Marie Svoboda** The tone is always informal in order to encourage the children to participate. Our instructors use thought-provoking questions to focus attention and interest, and that leads into using exhibits and individual specimens and artifacts to illustrate key concepts. The children are always eager to handle the real objects that are used in study-unit programs and workshops especially. They are then usually full of spontaneous questions, and that develops into the kind of interaction that shows the experience has taken on meaning for them.

**Ed.** I have seen many folders of appreciative letters in your office from both the students and their teachers. They certainly testify to what you've just said.

*Top:* Students in a workshop led by Edith Fleming try their hand at reproducing African rhythms on African instruments. *Bottom:* Students in the special summer anthropology program learn about archaeological field work by doing it at a site near Chicago. Photos by Ed Jarecki.

**Marie Svoboda** We are always pleased to get these letters, and we keep every one. Countless teachers have commented to us on the effectiveness of this style of teaching. They show their appreciation also by returning year after year with new classes.

**Ed.** Another program that your division originated is the self-guiding Journey for Children, isn't it? How does it work?

**Marie Svoboda** Every three months a new Journey tour is written around a theme—such as "Archaeology in the Midwest" or "Dog Meets Man"—and printed on single sheets which are available at the Museum entrances. Questions devised to stimulate the children's observation guide them to various exhibits to find the answers so they can write them on the sheet, which they turn in when they finish the tour—at their own pace. Every spring we have a Museum Travelers' Day and present awards to the boys and girls who have accurately completed all four Journeys during the year.

**Ed.** What is the Museum's special summer anthropology program that so many high school juniors apply for every year?

**Marie Svoboda** This is an intensive, formally structured program six weeks long, five days a week, which introduces highly motivated and talented students to the various aspects of anthropology. The group hears lectures by outstanding authorities in different fields of anthropology. It has seminars and workshops, which involve direct use and study of Museum collections. Participants report on an investigation of their own communities. And they spend a short but intensive period doing archaeological field work at a nearby site and make formal reports on their findings. Harriet Smith and Edith Fleming organized the program eight years ago, and we have been able to offer it every summer since thanks to renewed grants from the National Science Foundation.

**Ed.** Students usually apply for admission to this program through their schools, don't they?

**Marie Svoboda** They may, or they can get application forms directly from the Museum. The application period, which closes in March, is announced every year in the *Bulletin* and in newspapers as well as through schools.

*Extension Service to Schools*

Ed. Mr. Pressler, as coordinator of the Education Department's extension service, would you describe the program and perhaps some of its background?

David Pressler Our basic purpose is to offer school children and teachers of Chicago materials and experiences that are not ordinarily encountered in the classroom. In essence, we extend Field Museum into the classroom by sending materials and information from our own Harris collection.

Harris Extension was created by Norman Wait Harris in 1911 through a foundation for this purpose. In 1912 a committee composed of school principals, members of the Chicago Board of Education, and representatives from the four scientific departments at Field Museum recommended a unique format which would permit the safe circulation of materials from school to school. These are the familiar mahogany and glass exhibit cases with pull-out information plaques. The first of these cases, depicting a variety of animals in simulated natural environments, were circulated to 50 schools in 1914. Today a different exhibit is delivered to nearly 450 schools every 20 days, at no cost to the schools. In other words, we currently deliver approximately 7,600 exhibits during the school year.

In addition to these traditional exhibits, we have some exciting new ideas for changing the format of our materials to encourage children to interact more directly with objects.

Ed. I had noticed that you were assembling an interesting array of African artifacts in the anthropology conservation room.

David Pressler Yes, those materials are being selected to give us specific information about artifacts we hope to purchase from Africa for inclusion in our new "kits." These will be self-contained educational exhibit packages which will present several topics that we believe will be both interesting to children and useful to teachers. The presentation will include artifacts, specimens, and photographs—and possibly filmstrips and cassette recordings. Each kit will include concise background information which will enable the teacher to make maximum use of the kit, even if he or she is unfamiliar with the subject.

Ed. This sounds like a more complete form of the so-called multi-media approach that has gained popularity in the last few years.

David Pressler The similarity, of course, would be the use of filmstrips. However, I believe our kits will be much more dynamic and comprehensive because they will motivate students to interact directly with the materials. These materials will be selected for high visual and tactile appeal. We also expect to encourage *participation* through class discussion and specific activities designed to promote personal discovery and creative expression. We want children to learn *about themselves* in relation to the subject matter as well about the *subject matter* itself.

Ed. What are some of the topics that these kits will be concerned with?

David Pressler The kits already being developed will stimulate exploration of a variety of African arts from an esthetic as well as anthropological point of view. These will be separate kits on African sculpture, textiles, musical instruments, jewelry, leatherwork, basketry, and architecture. They will stress, for instance, the concept that African art, besides having great beauty, is often highly functional and tied to people's everyday needs as well as their cultural heritage. They will also demonstrate the concept that environmental conditions affect the choice of materials used by the many

David Pressler and Cynthia Mark (center) consult Maude Wahlman about authentic African specimens that could be photographed for new educational "kits" being designed for circulation to schools. Photo by Herta Newton.

different peoples who live on the African continent. Though these concepts are developed from the African context, they obviously have much broader application. We will suggest that students and teachers compare objects from different cultures, including our own, in order to develop a greater appreciation for the many ways of doing similar things.

Ed. What other exhibits are you planning in this new way?

David Pressler A kit based on the Scanning Electron Microscope exhibit is one—to introduce children to the exciting microscopic world. Through observation, discussion, and activities, we plan to strengthen children's awareness of and sensitivity to their environment. This kit will include high magnification photographs and activities using various magnification equipment to create a structured but a spontaneous series of personal experiences. Other kits will be about man in his environment, based on the major Museum exhibit now being planned; color in nature; masks, exploring the use of masks from cultures all over the world, including our own Halloween masks; stone tools, with actual stone implements compared with hand tools today. We may also design several different kits about ethnic America, each representing aspects of the cultural heritage of ethnic groups in the Chicago area.

### *Board of Education Courses*

Ed. Mr. Matthai, you mentioned some Board of Education courses that involve the Museum. How do they work?

Robert Matthai One is an anthropology course offered by the Metro High School Without Walls. Metro is an exciting and innovative idea that took shape in Chicago in 1970. Its purpose is to utilize community cultural and business resources for a kind of alternative education—alternative, that is, to the traditional high school classroom education. It is an option that any Chicago high school student may apply for—and they do apply from all over the city. The course that uses Field Museum as its community resource is called Origins of Humanness. The name comes from the core materials used, which are a book of readings plus "evidence materials" developed by the recently completed Anthropology Curriculum Study Project that was sponsored by the American Anthropological Association. In fact, the director of that project was Dr. Malcolm Collier, wife of Dr. Donald Collier, Curator of Anthropology at the Museum.

The Metro teacher for the course is Steve Everett. This year's class of 15 students come together every Friday afternoon at the Museum for discussion, to see films and study exhibits related to the course, and to learn directly from Museum curators and preparators.

As for the Museology course, Sue Maxwell, from the Chicago Board of Education Programs for Gifted Children, is now teaching it for the third year. Usually about 12 to 16 students are enrolled. They become acquainted with all aspects of the Museum—the research, collections, educational facilities, and exhibition techniques—and each student works in one-to-one relationships with members of the staff. Maybe the best kind of testimonial for such a course would be the students' evaluations, like this one, for instance: "Museology gave me the experience of learning for learning's sake, not learning only to pass an exam. It also provided me with a taste of learning by experience, not simply taking someone's word for it that this is the way it is. There should be more programs of this type open to all students."

Museology students Susan Grobstein, Sullivan High School, and Sydney Ross, Lindblom High School, working on scientific illustration of a wolf's jaw, get help from Samuel Grove, senior illustrator in Exhibition Department. Photo by Herta Newton.

creative ways and learn what they are doing. This is the idea behind a research project currently funded by the National Science Foundation. Barbara Reque at the Howland School here in Chicago is one teacher we are learning from. She is curriculum assistant there for Project Follow-Through, a federal program to improve the education of inner-city children. We are making a case study of a project she is working on cooperatively with two kindergarten teachers and their classes. They planned a visit to Field Museum to examine a series of human habitats, including the King's House from the Cameroons and the Hopi apartment. The teachers hope the children will learn something about how materials at hand influence the lives of people—the houses they build, the food they eat. Some of the things they did in the classroom before the visit were grinding corn into meal with stone tools and baking cornbread with it and constructing houses with materials like sticks and straw and stones. Then they toured the exhibits—in groups of just five or six children with an adult who asked them questions and encouraged them to record their impressions in on-the-spot drawings. Back in the classroom the children constructed model houses and tools with "modern" materials like metal and cardboard.

Ed. What should other teachers who want to get involved with your workshops or case studies do?

Alice Carnes Just write or call me at the Museum. And let me emphasize again that we want to learn as well as teach.

Barbara Reque, curriculum assistant for Project Follow-Through at Howland School, works with children on learning projects that prepare them for a visit to Field Museum to examine human habitats. Photo by Herta Newton.

Carolyn Blackmon

*Special Educational Services*

Ed. Mrs. Blackmon, you described our expanded volunteer recruitment and training program in the January *Bulletin*. Would you tell us now about the other special services you are working on?

Carolyn Blackmon Before I do I'd like to get another plug in for the volunteer program, because there was such gratifying response to that article from prospective new volunteers. For those who are interested in volunteer teaching for school groups, a 12-week training program will be given this fall. There are still many opportunities available in all departments. We especially need volunteers with specialized skills, such as translating, woodworking, and cataloging specimens. Master craftsmen such as weavers and potters and carvers are needed to give demonstrations for the public. These demonstrations will be part of new programs we are developing for Museum visitors to show how materials in our exhibits were made. We also have plans for mini-festivals that will present crafts, music, and dances of various cultures and ethnic groups. And more weekend film programs that relate to permanent as well as special exhibits and programs are being planned.

Ed. What's the new format for the Ayer film-lecture series that Bob Matthai mentioned? Customarily there have been a spring and a fall series every year. In fact, 1972 was the 50th year of continuous programming for the Ayer series.

Carolyn Blackmon For the 1973-74 season there will be the usual October-November and March-April programs (depending on the availability of the James Simpson Theatre because of possible rehabilitation work in spring 1974). Some programs will be given both Friday evening and Saturday afternoon, and additional programs

will be presented during the winter. Distinguished speakers will lecture on natural history topics. This new format will allow greater variety of programs and also opportunity for more people to take advantage of them.

Ed. Carolyn, since your plug for recruiting volunteers was so productive in January, let's note your Museum phone number this time—922-9410, extension 361.

James Bland and some of the materials he uses in his environmental workshop. Anthropologists and archaeologists frequently use the garbage left by particular cultures to reconstruct what that culture was like. In this case, some garbage of a modern culture is compared with that of a Neanderthal site to demonstrate modern man's enormously greater demands on his environment.
Photo by George Olson.

*Workshops for City Children*

Ed. Mr. Bland, would you tell us about the environmental workshop you have developed?

James Bland This particular workshop, designed for students from the sixth grade through high school, is thematically related to the major new "Man in His Environment" exhibit and program that the Museum is working on. Actually, "Man in His Environment" is being called a "program" because so much more than an exhibit will be involved. The purpose of the workshop is to acquaint students with the complexity of ecological problems and get them interested and involved in solving the problems. I start off by showing what an ecosystem is. Then we examine Neanderthal stone tools to discover what they can tell us about Neanderthal man's adaptation to the environment. Next we examine a selected sample of modern garbage, which leads us into considering our own impact on the environment—and its reciprocal effect on us. We learn about lung capacity and other anatomical details as they are affected by various pollutants. I'll be offering this workshop at schools and community centers as well as at the Museum. I find that kids who live in the inner city come up with some provocative thoughts about their own environments when we try to define the dimensions of the problem for city-dwellers. Questions like "What exactly is the urban environment?" "Does it include poverty as well as air pollution?" "Should an environmental 'casualty count' include the number of people killed by handguns as well as the deleterious effects of carbon monoxide in the air?"

Ed. You've been talking about your pilot workshop. Are there other environmental education programs planned?

James Bland I have presented a workshop for teachers in conjunction with the Chicago Board of Education, and for this summer a workshop on ecology is being planned jointly with the Shedd Aquarium. Julie Castrop and Martha Lussenhop and I are working on this together. Something I would especially like to do is organize a program to teach urban school children how to monitor air and water pollution in their own communities.

J. L. Williams

Ed. Ms. Williams, you are working on very different workshops for city children—built around Nigerian games and songs and dance. Would you describe what you do?

J. L. Williams I start with a story about the well known African folk tale character Anansi the Spider, who thinks he knows it all. The children mime the actions of the characters in the story as I read, using things I have brought along, like authentic African hats, rooster feathers, sheepskins, horsehair fly whips, and woven fabrics. Almost all kids love to act out stories, especially with real props. Then I teach them a game and a song from each of three Nigerian tribes—Yoruba, Hausa, and Ibo—and also the contemporary dance called the High-Life, which is so popular in urban Africa. Playing games, singing, and dancing are things children especially respond to.

Ed. How do you learn these games and songs and dances?

J. L. Williams From interviews with Africans living in the Chicago area. I'm working on a Zulu program now for the grade schools. I would like to offer an eight-week summer workshop of African dances and songs for high school students at the Museum.

Ed. Your own special talent as a dancer is certainly an apt background for these programs. Dancing has always been your avocation, hasn't it?

J. L. Williams I started to dance in college. Five years ago I joined the Julian Swain Inner City Dance Troupe. We perform Afro, modern, and Afro-Cuban dances at schools, jails, clubs, and concerts around the city. I have also studied Flamenco and East Indian dance, Tai-Chi-Chuan, and Yoga. And I'm presently teaching Arabian dance at Central YMCA Community College (under my professional name, Djalal). I have always been fascinated by the ways different cultures emphasize different parts of the body, different movements, and different rhythms.

Children at Louis Wirth School in Chicago became so excited about Ms. Williams' workshop that they put on an African festival for parents and friends. Photo by Ed Jarecki.

Ed. Mr. Matthai, these descriptions of the beginnings of the Education Department's workshops for city children sound exciting—especially because they are designed to go out to the youngsters as well as bring them into the Museum. Could you just mention some of the others that are still in the planning stage?

Robert Matthai Two other workshops we plan to develop will focus on American Indians and Latin cultures. For the latter, we'll have presentations in both English and Spanish. And I'd like to say more about other future plans and prospects for the whole department now.

Ed. What has already been said clearly shows that the Education Department has entered a period of dynamic growth and development. The floor is yours now to give us a glimpse of what else might be happening in the next few years.

Robert Matthai

*Future Prospects*

Robert Matthai The $1 million grant from the Kresge Foundation will provide a consolidated physical facility with adequate and contiguous office space and a fine variety of classrooms, laboratories, and other areas where educational innovations can be carried out.

Meanwhile, the next two or three years will see expansion and refinement of the programs that have been described here plus development of some others that I'd like to list.

One is a "sense gallery" where sighted and non-sighted people can explore the worlds of natural history through sound and touch.

Another is a series of radio and TV programs on natural history topics—perhaps on the Sesame Street model—directed particularly toward young children.

A third is a series of evening courses for adults, on such subjects as anthropology, nature photography, natural science, and the arts and crafts of various cultures.

We are also going to design a research project to discover how people learn from various types of exhibits.

We have even more new educational programs in store, but my great enthusiasm must be tempered by a dose of reality. The Kresge grant will take care of the necessary new and expanded physical facilities that these programs must have, but the costs of developing and establishing the programs are something else. Most of my new staff and our new educational programs are currently supported by grant money that must be renewed each year. And all of the future programs I've just mentioned will require new funds as well. I'm optimistic that the money can be found because I have such confidence in the quality of our educational ideas and the resources of knowledge and expertise in the Museum's scientific and exhibition departments.

The creative interrelationship of these three parts of the Museum is, after all, what the Museum is all about. The products of our combined efforts are what attract public interest and public support.

# Members' Nights

**May 3 and 4, 1973**
**6 p.m. to 10 p.m.**

## Annual spring open house featuring *Field Museum: The Inside Story*

Just as surely as May and balmy weather roll around each spring, so do Field Museum's Members' Nights.

A once-a-year occasion, this is an opportunity to go behind the scenes and meet members of the scientific, education, and exhibition departments and become acquainted with their work.

Focusing on the whole wide scope of Field Museum, this year's program also includes many special events, films and slides, entertainment, and a preview of a new temporary exhibit, "The Seventeen-Year Cicada: A Strategy for Survival."

Here are just a few of the things you can do:

**Learn** about Nature's plant dispersal methods.

**Participate** in an educational contest, "Spot the Fake," designed to help develop a critical eye in authenticating an artifact.

**Tour** the Department of Exhibition and see the extent and variety of artistic skills and processes utilized to prepare exhibits and graphic projects at the Museum.

**Appreciate** "We ShEll Overcome" (hundreds and thousands and millions of specimens!)

**View** "Glimpses of an Unknown World," a slide presentation, and hear the story behind "Below Man's Vision," a photographic exhibit exploring minute details in familiar plants and animals and common objects.

**See** "The Web of Life in a Gallon Jar—How to Construct a Balanced Terrarium or Aquarium."

**Explore** plate tectonics, a revolutionary geological theory explaining drifting continents, earthquakes, volcanoes, and the formation of mountains and minerals through a display and film.

Among the activities the Department of Education is planning is a self-guiding tour for youngsters, which will include a surprise at the finish line.

Roberta Carnagio, Jane Lamlein, and Alfreida Rehling, Department of Botany, working on their project, "The Garden of Eatin'," which will show the large variety of attractive and useful plants that can be grown from kitchen cast-offs.

Keith Carson, tanner, Department of Zoology, will demonstrate the preparation of large mammal skins.

# CALENDAR

## Exhibits

Opens April 11

**Adaptations of Amphibians and Reptiles,** an exhibit of photographs portraying the natural beauty and esthetic qualities of these animals, as well as illustrating some of their often remarkable and unique adaptations which help them survive. They were taken by Dr. Nathan W. Cohen, Chairman, Department of Continuing Education in Sciences and Mathematics, University of California, Berkeley. Through September 30. Hall 27.

Continuing

**Below Man's Vision: Electronic Windows to Unseen Worlds,** an exhibit exploring the world of details in common objects and familiar plants and animals, and offering glimpses into current research activities. Nearly 300 photographs, displayed at up to 200,000 times life-size, introduce a previously unseen world. Through July 15. Hall 18.

**Color in Nature,** an exhibit examining the nature and variety of color in the physical and living world and how it functions in plants and animals. Continues indefinitely. Hall 25.

**Field Museum's 75th Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

**Alexander Wilson's *American Ornithology.*** Copper-plate engravings made for *American Ornithology* (1808), a nine-volume work by the father of American ornithology, Alexander Wilson. Also shown are proofs from the plates recently pulled by Richard A. Davis, Butler University, and George McCullough, Fort Wayne Art Institute, alongside examples of first-edition prints of the same engravings in Field Museum's rare book collection. Through May 31. South Lounge.

## Film Program

Saturdays

**Ayer Adult Film Lecture Series** at 2:30 p.m. in the James Simpson Theatre.

April 7: **"Michigan Odyssey,"** narrated by Edward M. Bingham, Jr.

April 14: **"Russia,"** narrated by Dr. Arthur C. Twomey.

April 21: **"Jerusalem, Jerusalem,"** narrated by Richard Linde.

April 28: **"The Open Arms of Portugal,"** narrated by James Metcalf.

Saturdays and Sundays

**"Patterns for Survival"** (A Study of Mimicry), motion picture presentation at 1 p.m. and 3 p.m. in the second floor North Meeting Room

## Children's Programs

Continuing

**Spring Journey for Children,** "Life in the Tropical Rain Forest," a self-guided tour, encourages youngsters to learn about the inhabitants of the little-known Amazonian region by exploring Museum exhibit areas. Journey sheets are available at entrances. Through May 31.

**Spring Film Series for Children** at 10:30 a.m. in the James Simpson Theatre.

April 7: Fiesta-Cub Scout Day; **"Exciting Latin America."**

April 14: Egypt, Pyramids and Mummies; **"Ancient Land of the Pharoahs."**

April 28: **Museum Traveler Day;** annual presentation of Field Museum Journey awards and color film.

## Coming in May

Opens May 5

**Seventeen-Year Cicada: A Strategy for Survival,** a multi-media exhibit describing and interpreting the adaptive significance of the unusual life cycle of these strange insects. Millions of cicadas (locusts) are scheduled to make their noisy appearance above ground in the Chicago area in late May or early June of this year. Through July 29. Hall 9.

## Meetings

**April 8:** 2 p.m., Chicago Shell Club

**April 10:** 7:30 p.m., Nature Camera Club of Chicago

**April 10:** 8 p.m., Chicagoland Glider Council

**April 11:** 7 p.m., Chicago Ornithological Society

**April 11:** 7:30 p.m., Windy City Grotto, National Speleological Society

**April 12:** 8 p.m., Chicago Mountaineering Club

**April 20:** 7:30 p.m., Chicago Anthropological Society

**April 24:** 7:30 p.m., Nature Camera Club of Chicago

**April Hours**
Saturday through Thursday, 9 a.m. to 5 p.m.; Friday, 9 a.m. to 9 p.m.

The Museum Library is open 9 a.m. to 5 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

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# Field Museum of Natural History Bulletin

**Field Museum of Natural History Bulletin**

Volume 44, Number 5
May 1973

Cover: An adult 17-year cicada. Photo and design by Clifford Abrams.

**2 It's the Year of the Cicada—in These Parts**
Henry Dybas
our local 17-year periodical cicadas are due to do their thing this spring

**9 Animals, Earthquakes, and Eruptions**
Caroline J. Anderson
according to folklore—and some documentation—animals have early warning perceptions of impending geologic disasters

**12 A Showcase of Adaptations in Amphibians and Reptiles**
Joyce Marshall Brukoff
some choice facts and photos from a new temporary exhibit

**16 Field Briefs**

**Calendar**

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# It's the year of the cicada

## Henry Dybas

One warm night in late May or early June the cicada nymphs of Brood XIII will emerge from the ground in enormous numbers to enjoy a few short weeks of adulthood as they mate and produce offspring they will not live to see hatch. A cicada emergence is a busy, noisy affair that attracts a great deal of popular attention and interest.

Brood XIII is the name by which entomologists identify our local northern Illinois population of 17-year cicadas, thereby distinguishing it from other populations of periodical cicadas in the United States. Periodical cicadas are found only in the deciduous forest areas of the eastern third of the country and their extensions into the plains states. Though all 17-year cicadas have the same long lifespan from egg to adult, different populations are on different calendar-year schedules. In northern Illinois, including the Chicago region, there is only one population, or brood, of periodical cicadas. We saw the previous generation of them in 1956.

Periodical cicadas should not be confused with the annual "dog day" cicadas (also called harvest flies), which produce their own characteristic buzz-saw sound in the tree tops on hot summer days. These are predominantly black and green and do not have the red eyes and orange wings of the periodical cicadas. They are annual in the sense that some individuals appear every year but require a number of years, presently unknown, to develop underground.

It is easy to predict the year of emergence of 17-year cicadas in any one place because each brood has remained precisely on its own particular 17-year schedule as far back as the records go. Thomas Jefferson mentioned the appearance of the Virginia brood of 17-year cicadas in 1775 in his account book for that year and recalled their earlier emergence in 1758, also referring to previous emergences in 1741 and 1724 on the testimony of a Dr. Walker; "it appears

Author went into the field last winter to dig up cicada nymphs and study their preparations for emergence this spring.

Sliced-open view of a nymph escape tunnel capped by a turret.

# — in these parts

then that they come periodically once in 17 years," he concluded. Nearly two centuries later, Professor Monte Lloyd of the University of Chicago and I planned field studies of this same brood of cicadas in Virginia for 1962 with absolute confidence that it would still be right on schedule—and of course it was.

The distinctively colored adult 17-year cicadas are large as insects go—about 1½ inches long. They begin as eggs which the adult female lays in slits that she cuts in twigs of trees and bushes with a blade-like organ called *ovipositor*. There may be as many as 15 to 20 eggs deposited in one slit, and the female continues to lay throughout her short-lived maturity. The eggs hatch in about seven weeks, and the tiny white nymphs crawl out of the slit and drop off to the ground. Each nymph is only about 1/12-inch long at this stage.

Once on the ground the nymph works its way into the soil and attaches its beak to a tree rootlet to sustain itself by sucking the sap as it grows slowly in its solitary underground cell for the next 17 years. If the root dies, the nymph must make its way to another site. It does this by scraping soil with its powerful front legs from one side of the cell and plastering it on the other side. Thus the nymph perambulates its intact cell as a mobile home until it encounters another root.

Late in its 16th year the nymph begins to construct a vertical escape tunnel which by early spring of the 17th year has reached the ground surface. Sometimes the tunnel is capped by a turret one to three inches high. In any case, the tunnel remains closed until some warm night in May or early June, and then the nymph crawls out of the ground about dusk along with thousands of others.

Each brown nymph climbs up a nearby tree trunk or other plant stem, leaving a smooth round exit hole in the ground about ½-inch in diameter.

Nymph emerging from the ground.

The cicada escape holes shown here represent a moderately dense emergence.

The cicada nymph begins its transformation by fixing its claws firmly in the plant tissue.

Its skin splits down the middle of the back and a soft white adult with red eyes begins to emerge.

The nymph fixes the claws of its legs firmly into the plant tissue, its skin splits down the middle of its back, and a soft white adult with red eyes begins to emerge. It pulls its head and legs out of the nymph skin first, then the abdomen. Meanwhile, blood pressure pumps up its crumpled wing pads until they are fully expanded. This entire process of *eclosion,* as entomologists call it, takes place in about 30 to 90 minutes. It is one of nature's commonplace miracles. The body gradually colors and hardens, and in the morning the newly matured adult seeks a sunny spot on a leaf to bask until its body is warm, and then it flies up into the tree tops.

A few days later the males begin to form large singing choruses. Females are attracted to these choruses and mating and egg-laying follow. Adults live only about three weeks even if birds and other enemies don't get them, so by late June or early July they have disappeared almost as quickly as they appeared. Only exit holes, empty nymph skins, and browning twigs from egg-slit damage remain as evidence of the emergence.

The fact that adult cicadas are commonly called "locusts" invites confusion with the true locusts, or grasshoppers, which chew green leaves. Cicadas do not. Cicadas feed by inserting their beaks into thin bark on tree trunks and sucking the sap, which causes no detectable harm to the plants.

The damage attributed to cicadas comes from the egg-laying activities of the females. If a lot of slits are made in a twig, the twig may die. Thus an oak-hickory forest which hosts a dense emergence of cicadas may acquire a scorched appearance, but this kind of natural pruning does not seem to harm larger trees.

Some twigs may die as a result of egg-slit damage but this kind of natural pruning does not seem to harm larger trees.

It pulls its head and legs out of the nymph skin first.

The cicada then reaches forward, grasps the nymph skin by its legs, and pulls the rest of its body out of the skin.

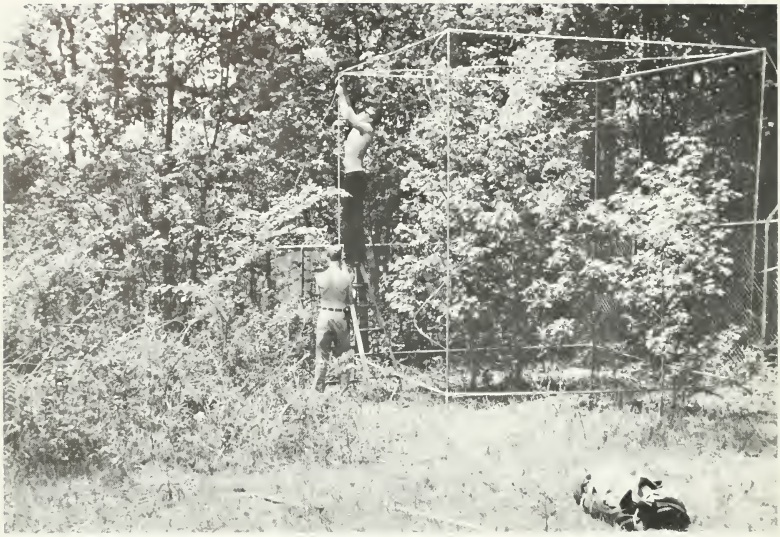
However, newly planted tree saplings or small shrubs can be severely damaged if there is a dense cicada emergence nearby. Plantings can be protected by covering them with netting to keep out egg-laying female cicadas. Cicadas are also responsible for a problem called "orchard decline." In some heavily sprayed apple orchards there are so many cicada nymphs sucking sap from the roots underground that the trees do not produce much fruit and they put on little new growth.

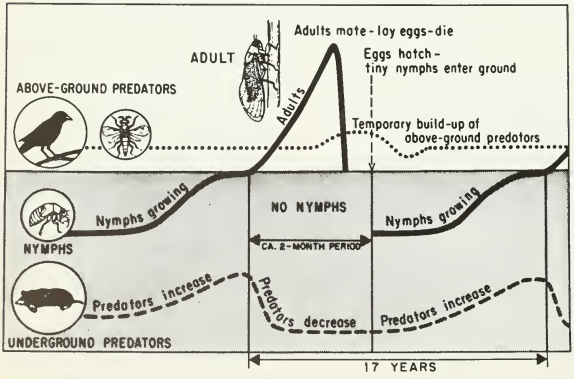
The numbers of cicadas in an emergence can be astonishing. After an emergence is completely over, the numbers can be quite accurately estimated by counting the characteristic smooth, round exit holes of the nymphs in a unit area and applying proper statistical procedures. The walls of the holes are tightly compacted and remain intact for months unless obscured at the surface by mole activity or some other disturbance.

Professor Lloyd and I have made censuses of a number of different areas and broods in this way over the years. The record density was in a floodplain forest near Chicago in the 1956 emergence of our local brood. At peak chorusing in mid-afternoon the sound was so intense that two persons face to face in this woods could not hear each other talk. We found an average of 311 holes per square yard, or about 1,500,000 per acre in this habitat. (For purposes of visualization, there are about 3½ acres in an average city block in Chicago. However, cicadas do not emerge in the city proper to any extent. One must go out to the suburbs or forest preserves to find them.)

The weight (biomass) of this density of cicadas was calculated at about a ton per acre, which appears to be the highest recorded per unit of habitat for a terrestrial animal under natural conditions. Herds of African game animals temporarily achieve greater biomass per unit area, but of course they need much larger areas to support them over a full year. Indeed, the weight of cicada protoplasm produced in that floodplain compares

Blood pressure pumps up the wings of the new adult until they are fully expanded.






*Above:* In a forest opening, a screen cage is being constructed around living trees for an experiment involving cross-mating of 17- and 13-year cicadas. *Left:* Diagram of predator-prey relationships throughout life cycle of 17-year cicadas; linear distances are not in proportion to time spans represented.

favorably with the best annual yield in weight of beef cattle that man can produce on carefully managed pastures.

In the adjacent upland forest, the density of cicadas was about 27 per square yard, or about 133,000 per acre. These numbers are more like those usually encountered in a cicada emergence. They are much less than in the floodplain but still represent an enormous population for insects of this size.

During a periodical cicada emergence all kinds of predators turn from their normal sources of food to cicadas. Crows, grackles, skunks, raccoons, copperhead snakes, caterpillar-searcher beetles, and a host of other animals appreciate and feast on them. One night when I was working on cicadas in the woods I noticed my dog gorging himself on emerging nymphs to the point where I became concerned for him. It was impossible to make him stop eating, and I finally had to lock him up in the car. Cicadas are reported to have been eaten by Indians also. Those of us who have tried them describe the taste as something like that of a raw potato with a touch of avocado or clam juice.

Even though periodical cicadas are so palatable and easy to capture, their appearance is so sudden and in such great numbers that the birds and other predators can eat only a part of the population before the rest have reproduced and died a natural death. Even after flocks of grackles scour the woods at the end of an emergence, there always are left on the ground a lot of spent, intact bodies of cicadas that have lived out their full natural life.

All this suggests that the 17-year cicadas have evolved a very successful strategy for foiling their predators and perpetuating their species—by the combination of their overwhelming numbers and their extraordinarily long life cycle. Seventeen years represent the longest life cycle by far of any insects. Cicadas spend about 99 percent of this 17 years in a highly protected environment underground, and then when they emerge their numbers swamp the consumption capacity of the predators.

This pattern is quite unlike that of any other insect species, especially the many which have specialized enemies whose life cycles are synchronized with those of their prey. We do not know of a single predator that is synchronized with periodical cicadas, probably because none has been able to evolve a 17-year life cycle.

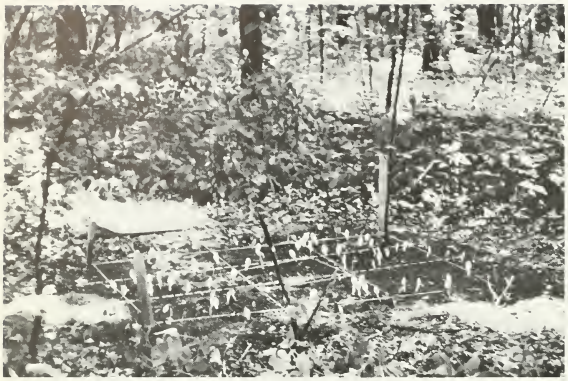
One can speculate that periodical cicadas did have synchronized predators in their early history, before the cicadas evolved their present long life cycle. If so, those cicadas that possessed the ability to delay emergence—by one year, say—would emerge above ground after their predators had come and gone, and thus they would be favored by natural selection—at least until the predators caught up. This could have initiated a contest as to which had the physiological ability to extend dormancy the longest—an evolutionary race that the cicadas won and the predators lost, with consequent extinction of the latter. This speculation may be too neat, and the hypothetical predators too conveniently disposed of, but it is hard to imagine any other plausible reason for the evolution of such an improbably long life cycle.

Incidentally, the precise timing of emergence at the end of 17 years is not due to a uniform growth rate of the nymphs. We have dug up nymphs at intervals and found that by the 5th or 6th year some may be as much as eight times bigger than others. Most nymphs reach their full growth the 12th year and mark time till the 17th year, which in effect allows the laggards time to catch up. The synchronized emergence, therefore, is very probably due to some physiological mechanism which "counts" 17 years (perhaps 17 winter periods when no sap circulates in the roots).

Whatever the timing mechanism is, it is unusually precise, but it is not infallible. Almost every year there are some stragglers, though these constitute a trivial fraction of the main population. But in 1969 there was an extensive *premature* emergence, four years too soon, of periodical cicadas scheduled to emerge in 1973 in the Chicago region. Nothing of this magnitude had ever been reported before in the writings on these insects. There are 13-year periodical cicadas in the southern states that are the same as the 17-year cicadas (as far as anyone can tell by looking at them or listening to them) except for the length of the life cycle. (No 14-year, 15-year, or 16-year cycles have ever been reported.)

Lloyd and I had earlier postulated, on theoretical grounds, that 17-year cicadas evolved from 13-year cicadas (or vice versa) by a quantum jump of four years somewhere back in the evolutionary history of the group. However, we never expected to have a ringside seat to observe a repeat performance of such an evolutionary event.

Three facts may explain this event. One is that 13-year cicadas live in warmer climates than their 17-year relatives. Another is that all the premature cicadas reported in 1969 came from a ring of suburbs around the city of Chicago. The third is the well-known fact that large metropolitan areas form "heat islands" with a climate appreciably warmer than the surrounding countryside. Could we have observed a natural "experiment" by which 17-year cicadas, having been in effect "transplanted" to a warmer climate, thus became 13-year cicadas? We made sample census counts of the premature cicadas on certain plots in 1969 and have kept these plots under observation since then for signs of stragglers. Therefore, when the 1973 emergence is over and



Colored plastic spoons are useful in a cicada field study to show density and spacing of emergence holes in the forest floor.

censused, we shall have a good idea as to what percentage of the underground population was involved in the "mistake."

We will also repeat our censuses of the upland and floodplain sites we studied 17 years ago. No one has ever censused periodical cicadas through two successive generations before. We expect to learn more about the differences between the three distinct species that are now recognized. Two will be very abundant in the Chicago area this year.

All three species not only have the same long 17-year life cycle, they mostly inhabit the same region and, in a given locality, come out of the ground together the same 17th year. The three are similar in appearance, but each has distinctive markings, each prefers a different kind of habitat, and the songs of the males are very distinct. Once one is attuned to the song differences, it is possible to go into a woods and identify the species present just by listening. The "upland cicada," *Magicicada septendecim,* is the largest species—about 1½ inches long from head to tip of closed wings —and has a reddish stripe between the eye and base of wing and yellow cross-banding on its belly. It prefers upland oak-hickory forests like those in the Cook County Forest Preserves around Chicago. The "lowland cicada," *Magicicada cassini,* about 1¼ inches long, has no stripe and its belly is either dark or has only traces of banding. It is found mostly in floodplain sites. The "upland dwarf cicada," *Magicicada septendecula,* also about 1¼ inches long, has no stripe, does have a yellow-banded belly, and is usually associated with hickory trees. It is almost always much less numerous than the other two species.

Shortly after our original census and study in 1956, Dutch Elm Disease entered this area and began to kill off the elms, which were the dominant trees in the floodplain sites. The nymphs from the 1956 emergence which were then feeding on the rootlets of those trees were very small when the trees began to die, so it will be interesting to see what end effect this disaster—as another natural "experiment"—has had on the cicada population. Such a disaster is comparable to other naturally occurring phenomena like forest fires, tornadoes, land slides, and so forth, and most natural populations have had to evolve the ability to cope with them. Since the upland habitats look exactly the same, they will in effect be the "control" for the "experiment."

We also hope to find out whether cicadas achieve an equilibrium that remains relatively constant between successive emergences in a particular area or whether populations fluctuate widely from generation to generation. We will be assisted in these and other studies by Jo Ann White, who is a graduate student in the Department of Biology at the University of Chicago and in Field Museum's Center for Graduate Studies. She will also conduct radioactive tracer studies to see whether the eggs absorb nutrients from the sap in their twig slits. In addition, Drs. Thomas Moore and Richard Alexander, of the Museum of Zoology at the University of Michigan, plan to come to the Chicago region to continue their interesting studies on the remarkable acoustic behavior of 17-year cicadas.

The combined results of all these field studies should allow a few more pieces to be fitted together in the puzzle of the unique life history of 17-year periodical cicadas.

*Henry Dybas, Curator and head of the Division of Insects at Field Museum, is one of the country's leading experts on periodical cicadas.*

**Come and tune your ear to the distinctive chorusing of the different species of periodical cicadas in a multi-media exhibit opening May 5–The Seventeen-Year Cicada: A Strategy for Survival.**

# Animals, Earthquakes, and Eruptions

*Caroline J. Anderson*

The dogs of the Nanawale Ranch on the Island of Hawaii were acting strangely on February 26, 1955. They ran around excitedly, dug holes in the ground and sniffed in the holes as though in pursuit of some burrowing animal. Dr. Gordon A. MacDonald, then director of the Hawaii Volcano Observatory, was called. For months he and his colleagues had suspected that a volcanic eruption might be immanent, although they couldn't predict exactly when it would occur. Each day there were increasing numbers of earth tremors at the Nanawale Ranch, and now this unusual behavior of the dogs. The scientists spent most of the day February 27th investigating the area. No cracks could be found. No odor of volcanic gases could be detected even when they sniffed in the holes made by the dogs. Yet the following morning the eruption began just a quarter-mile from where the dogs had been digging.

This puzzling story of animal behavior is not surprising to geologists, for they are well aware of the very persistent folklore which says that animals can predict earthquakes and volcanic eruptions. This folklore often appears in popular accounts and even in textbooks, but the discussion is usually limited to an anecdote or two. I began to wonder just how many such anecdotes there are and whether anyone had ever taken them seriously enough to investigate.

Certainly there is evidence that for generations men around the world have been interested in the behavior of animals prior to earthquakes and eruptions. Deodatus De Dolomieu, for example, wrote of this interest in 1784 when he visited the Calabria Ultra district of Italy in the year following a destructive earthquake. He commented that animals seem to have some warning of such geologic disasters, although people do not:

> The prescience of animals of the approach of earthquakes is a singular phenomenon, and is more surprising to us from our ignorance by what sense they receive the intimation. It is common to all species, particularly dogs, geese, and domestic fowls. The howlings of the dogs in the streets of Messina were so violent, they were ordered to be killed.

About fifty years later, in quite a different part of the world, another story of unusual behavior preceding an earthquake was documented by Robert Fitzroy, captain of the *Beagle*, during Charles Darwin's famous voyage. The ship was in the vicinity of Concepcion, Chile at the time of the 1835 earthquake, and Fitzroy hurriedly returned to that port to survey the damage. He recorded in his diary this account of an observation told to him:

> At ten in the morning of the 20th of February, very large flights of sea-fowl were noticed, passing over the city of Concepcion, from the seacoast, towards the interior: and in the minds of old inhabitants, well acquainted with the climate of Concepcion, some surprise was excited by so unusual and simultaneous a change in the habits of those birds . . . At forty minutes after eleven, a shock of an earthquake was felt . . .

Fitzroy's diary also recorded that dogs fled from the city of Talchuano prior to the destruction of that city in the same earthquake.

There are several other animal-earthquake stories from the nineteenth century. Many are summarized in a review entitled "Can Animals Predict Earthquakes?" published in a 1909 issue of the *Scientific American Supplement*. Included among those incidents are the following: roosters crowed before the Java earthquake of 1867; the earthquake in Iquique in 1868 was announced several hours earlier by screaming gulls and other sea birds that flew inland; and in 1887 the horses of the Riviera appeared very anxious prior to an earthquake in that area.

Probably the best known of all animal-earthquake stories dates from the beginning of the twentieth century. The dogs of San Francisco were reported to have barked the night before the great earthquake that struck that city in the early morning of April 18, 1906. This observation was recorded in the official *Report of the State Earthquake Investigation Commission* and is derived from an informal survey made by Finette Locke. She also noted several cases in which horses and cows snorted or stampeded a few seconds before observers knew there was anything wrong. And cats were reported to perceive the aftershocks before people did.

Cattle were reported to have left their grazing grounds on Mt. Arenal in Costa Rica just before its disastrous surprise eruption in 1968—but many were still scarred by it. Photo courtesy of Center for Short-Lived Phenomena.

Geologists in Iceland uncovered another anecdote when they set out to piece together the antecedents of the surprise 1947 eruption of Mt. Hekla. The scientists were told by a man and his wife that they were awakened between two and three o'clock one morning and the wife went into the kitchen. "When she turned on the light she found their old dog, which used to sleep out by the kitchen door, standing in the middle of the floor, apparently greatly frightened by something . . ." The eruption occurred at 6:40 that morning.

Eloise Engel's book *Earthquake! The Story of Alaska's Good Friday Disaster* contains more such animal stories. Rancher Louis Beatty, for example, had gone up to the hills at three in the afternoon when his cattle unexpectedly left their low-lying grazing grounds hours before their usual time. Late that afternoon there was an earthquake, and a great sea wave (tsunami) covered the low-lying area.

Author Engle also tells of animals being uneasy before the 1965 volcanic eruption of Taal in the Philippines. She wrote that the residents of Taal were awakened at 2:30 in the morning by the noise of frightened dogs, cats, and cattle. Some of the people heeded the animals' warning and fled. The volcano erupted, spewing lava, ash, and mud over their homeland.

Tom Simkin, a geologist investigating the 1968 Mt. Arenal eruption in Costa Rica, reported hearing that cattle moved down off that volcano just before it erupted. This surprise eruption was the first for Arenal in about four hundred years.

Finally, there's an interesting animal-earthquake report from the People's Republic of China. Robert S. Coe, an earth sciences professor from the United States, visited that country recently and wrote of their new earthquake prediction program initiated following a large earthquake in 1966. Along with modern physical devices, peasant volunteers have been recruited to observe anomalies in animal behavior. According to Coe: "Before the 1966 earthquake and its largest aftershocks there were reports of strange behavior, especially of rats. No anomalous behavior has been observed before the smaller earthquakes that have been characteristic of the period since then."

All of these anecdotes are references to specific earthquakes or eruptions. In addition, several of the geologically active countries are said to have generalized beliefs about animals. Vitus B. Droscher, in his book *The Magic of the Senses,* gives this example: "In the villages on the slopes of Mount Etna the peasants keep cats because they believe these animals can anticipate volcanic eruptions: when all the cats leave the houses at once, men will rush out after them." John Milne and A. W. Lee, in their book about earthquakes, give a similar example from another part of the world: "It used to be said that several of the natives of Caracas possessed oracular quadrupeds, such as dogs, cats, and jerboas, which anticipated coming dangers by their restlessness." Those authors also mention the Japanese belief that pheasants crow before earthquakes.

It was this last legend that prompted one of the few systematic attacks on the question of whether animals could in fact anticipate earthquakes or volcanic eruptions. This work was done by a famous Japanese scientist, F. Omori. In the period 1913 to 1916 he worked in the evening in a quiet house where he could hear pheasants crowing in a neighboring garden. He took upon himself the task of noting the time of every perceptible earthquake and comparing it with the crowing of the pheasants and also later checking the tromometer, an instrument for recording minute earth tremors. In eleven out of the twenty-three cases recorded, the pheasants were actually better than Omori. That is, in those cases the pheasants either crowed before the scientist felt the quake or crowed when he felt no quake but found that one had been registered by the instruments. Passing vehicles which shook the ground did not cause the pheasants to crow.

A more extensive attempt to explore the ability of animals to predict earthquakes was a study published in 1964 in German by Ernst Kilian. His work followed the large 1960 earthquake in southern Chile. The report involved mostly anecdotes which he solicited by advertisements in the local papers. But he also made direct observations of the behavior of animals associated with aftershocks in the days and months following the major quake. He found that the horses at the university experimental farm always reacted by neighing and trembling five seconds before a quake was felt by people. This agrees well with the stories which came out of the San Francisco earthquake of 1906.

Kilian also reported that pheasants crowed ten seconds before shocks were felt by people. There was one anecdotal account of a dog which became quite upset by the rumbling sounds which preceded the major quake, but otherwise no reports of either dogs or cats behaving strangely until the quake occurred. Kilian summarized his paper by pointing out that the number of observations was small and often laden with the emotionality of the observer. He had not found definite proof that animals could predict earthquakes.

There are apparently no other major scientific studies of animal behavior prior to earthquakes or eruptions, but there are undoubtedly many other anecdotes. It is evident that it is these occasional, intriguing incidents, not proven performance, which have given animals their reputation as predictors.

While horses, dogs, pheasants, and sea birds seem to be implicated most often, there are of course countless earthquakes and eruptions where no anomalous behavior of animals was noted. And, as Kilian suggested, the human element cannot be dismissed. From the reports of people who have lived through major quakes, it is apparent that few experiences are more unnerving. It would not be surprising if the observations of such people are inaccurate or incomplete.

Still, one is left wondering about the many isolated stories of animals seeming uneasy preceding an earthquake or volcanic eruption. Since both earthquakes and eruptions originate within the earth and both involve earth tremors, it would seem natural to assume that the earth movement in some way stimulates the animals' unrest. Many experts would agree. For example, it is the judgment of renowned seismologist Charles Richter that if anything other than coincidence is involved, it is likely that the animals notice small foreshocks to which people are insensitive. Sigurdur Thorarinsson, a famous Icelandic geologist, has a similar opinion. He has said that, while studying the aftershocks of an earthquake, "I had several opportunities to ascertain that domestic animals, and especially cats and dogs, felt tremors that were imperceptible to me and other people." Several changes in addition to earth movement which might possibly cause anomalous animal behavior have been discussed by Kilian. Such stimuli include increased air pressure and changes in the electric or magnetic field. Still another theory, explored by Baxter Armstrong in 1969, is that in some cases the high frequency sounds of preliminary fracturing may disturb animals.

There are no definitive answers yet. A greater understanding of both geologic events and animal sensory systems may solve the mystery. Until then we're left to puzzle over the fascinating folklore which says that animals can predict earthquakes and volcanic eruptions.

*Mrs. Caroline J. Anderson is a psychologist and is married to a geologist, whom she has accompanied on field trips to many volcanic areas.*

*A copy of the bibliographic citations for the several published accounts referred to in this article is available on request. Please address such request to the* Bulletin.—Ed.

## *A showcase of adaptations in amphibians & reptiles*

*Joyce Marshall Brukoff*

Reptiles especially have been long misunderstood, thanks to the mythology of human origin embedded in the Judeo-Christian traditions of our culture. If for no other reason than that, one should see a new temporary exhibit of fine photographs now on display at Field Museum. It reveals many esthetic as well as unique qualities of these much maligned animals and of their relatives the amphibians. The photographs were taken by Dr. Nathan W. Cohen, Chairman of the Department of Continuing Education in Sciences and Mathematics, University of California, Berkeley. His exhibit is designed to give us some insight into the often remarkable adaptations for survival of these two great classes of animals as well as an appreciation of their real beauty.

Although amphibians and reptiles are sometimes confused because both groups belong to the "cold-blooded fraternity," there are many easy ways to tell them apart. The most obvious is in the nature of the skin. Lizards and snakes, turtles, crocodilians, and tautara all have a dry skin type which is made up of a tough integument composed of plates or horny scales. The amphibian group—which includes frogs, toads, salamanders, and the caecilian—have a comparatively smooth skin. It is moist and laden with mucous and poison glands.

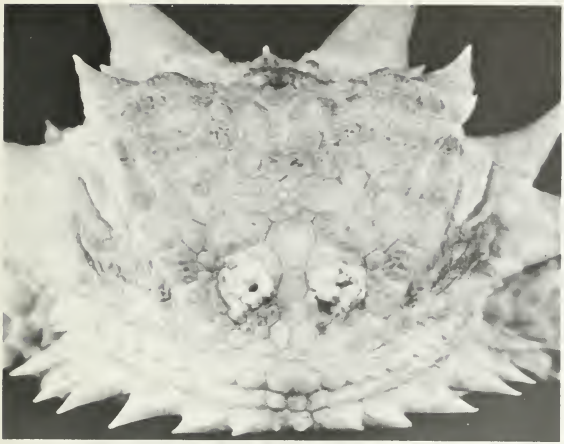
The evolutionary history of these two great classes of vertebrate animals far exceeds the history of mammals. Amphibians represent the beginning step from an entirely aquatic existence toward a terrestrial one. Reptiles represent the next step. Both groups evolved striking adaptive features which reflect their respective environments.

Most of the photographs in the exhibit illustrate one or more of these adaptations—for defense, for obtaining food, for locomotion, and many other categories. At times an adaptive mechanism will serve two functions. This is true of the potent poison utilized by the rattlesnake. It serves as a defense against other predators and also enables the snake to kill its prey quickly without engaging in a bruising battle.

Probably one of the most interesting adaptive qualities belongs to the reptiles—the shedding of skin. They must get rid of their essentially inelastic skin periodically in order to grow. In snakes this shedding usually begins at the head end, with the animal gradually moving out of its old skin, turning it inside out in the process. Even the old eye covering comes off. Lizards usually flake off dead skin in patches, sometimes in nearly one whole piece.

Adult lizards molt every month or so, mostly in patches, sometimes a scale at a time. The industrious banded gecko rips off the old skin with its mouth and proceeds to swallow the strips. In snakes the process begins several days before actual shedding. The animal's eyes cloud over and the skin takes on a dull and lifeless appearance. When the actual shedding is about to begin, the snake helps things along by rubbing its mouth against a rough surface. The skin comes off like a glove, with the entire operation sometimes over in as little as half an hour.

Another fascinating adaptive quality, limited to just a few types, is subterranean living. Like the well known blind fish shown to tourists in Mammoth Cave in Kentucky, some snakes and lizards also have become adapted for underground existence. Such existence can vary in degree, from burrowing and sand-swimming to a totally underground life.



Flat-tailed horned lizard. Its nostrils are encrusted with salt excretions.

Portrait of yellow-eyed salamander showing his "naso-labial grooves."

Armadillo lizard in defensive posture: its tail in its mouth.

Pacific rubber snake in defensive stance: its vulnerable head buried under its coils and its tail above as a decoy. An enemy invariably bites the wrong end, as evidenced by the scars on the animal's tail.

Gila monster

Surinam toad

African clawed frog

Some common adaptations to this type of environment are loss of vision, reduction or loss of limbs, and loss of body pigmentation. Animals also adapt in other, more specific ways which vary in each type. The silvery legless lizard, for instance, has a shovel-shaped snout and an underslung lower jaw, which prevent sand from entering his mouth. The Florida worm lizard has no legs or ear openings and has a soft, ringed body which bears resemblance to an earthworm. The sand viper of African deserts covers itself with sand, leaving the black tip of its tail protruding from the surface as bait for prey.

Of course, some of the most important adaptations have to do with obtaining food and with defense. For food, some species sit and wait for prey to come to them. Others trick their victims into the danger zone. The Surinam toad is a rather strange looking amphibian who chooses to sit and wait. When the intended meal comes close, the toad surges forward, opens its cavernous mouth and, with the help of star-like fingers which push, sucks in the prey.

In the reptile family we have a variety of mechanisms for dealing with prey, from the needle-like fangs of the red diamond rattlesnake to the tricky system used by the alligator snapping turtle. The latter lures prey into striking distance of its open mouth by wiggling two red, worm-like appendages on its tongue.

All species must not only obtain food, they must defend themselves from their predators. Some of these adaptations are quite elaborate. Perhaps the most well known defense of reptiles and amphibians is the famed rattle of the rattlesnake. To achieve its menacing sound, the snake merely wiggles his tail—"vibrates" would be more accurate—about 60 times per second. The segments within the tail are very loosely articulated with each other. As the tail vibrates, the segments hit against one another, producing the unforgettable buzzing sound of a snake about to strike.

Different species use many different types of locomotion, which are also very specialized adaptations. The zebra-tailed lizard, who can spurt along at a full speed of about eighteen miles an hour, has a long, flat tail which allows it to use only its hind legs. With its forelimbs lifted off the ground, the tail acts as a counterbalance, curled over the back.

The deadly poisonous cottonmouth snake was named for a defensive adaptation. When threatened, the gaping mouth reveals a startling white interior which, set off by the black exterior color of the snake, serves as a very adequate warning. The yellow-eyed salamander uses the poison glands in its tail to quell enemy attacks. When danger nears, the animal swishes this deadly tail, threatening an encounter from its poisonous secretions.

A rather bizarre defensive posture is employed by the armadillo lizard. When pursued, this wily fellow runs into a narrow crevice and takes its tail in its mouth. Protected on either side by its position in the crevice, it protects its soft-skinned underbelly with the array of sharp-pointed scales on its back, which usually discourage an attacker.

The flat-tailed horned lizard has an interesting trait that adapts it to its desert environment. It excretes unwanted body salt through its nostrils with insignificant water loss. A watery urine to carry off excess salts would certainly be a much less efficient method in such an environment, where conservation of moisture is crucial.

The well known gila monster, another desert inhabitant, stores food (fat) in its tail during times of abundance and uses it later in periods when food and water are scarce. The gila monster is one of only two venomous lizards in the world, the other being the beaded lizard of Mexico.

Like any other animals, amphibians and reptiles have sensory systems which are adapted to their respective environments. A particularly interesting one is that of the lungless salamanders: they breathe through their skin. The Sierra Nevada salamander and the yellow-eyed salamander, both lungless, are shown in the exhibit. They have "naso-labial grooves" which extend from the upper lip to each nostril. This structure alerts the salamander to the presence of odors, principally those pertaining to food or danger. The lungless salamanders have a tendency to live in moist or damp places, but for obvious reasons they seldom enter the water.

Unique, stitch-like bumps on the African clawed frog make him look as if he had been sewn together with a rather inept hand. They are not seams, however; they are believed to be highly developed sensory organs which alert the frog to the movement of prey or predators.

The famed Colorado desert sidewinder shares with other pit vipers a remarkable "pit" organ which is actually an infrared detector, extremely sensitive to heat. This useful organ detects warm-blooded rodents either above ground or snuggled in the supposed safeness of their burrows.

When we realize that amphibians and reptiles once were the dominant forms of life on earth, we must marvel at the seemingly curious and extraordinary adaptations that enabled their contemporaneous descendants to persist into our time, many relatively unchanged since long before mammals came to dominate the earth. The current exhibit of photographs of amphibians and reptiles presents a tantalizing and informative glimpse of this world of animals with mechanisms and behavior quite remote from ours.

*Joyce Marshall Brukoff is a Chicago-area naturalist and free-lance writer.*

# FIELD BRIEFS

## Archaeological Expedition to Indonesia

Bennet Bronson, Assistant Curator of Asian Archaeology and Ethnology, is on his way to Java and Sumatra to direct a new archaeological research project for several months. The project will involve training and aid for Indonesian archaeologists as well as extensive exploration in Sumatra to identify sites for future excavation.

The Sumatran rain forest is, according to Bronson, "one of the last unexplored archaeological frontiers." He is especially hoping to locate two sites: the capital of the historical sea kingdom of Srivijaya, and Angkor, one of the two great empires of early Southeast Asia.

## The New Chicago Anthropological Society

A revivified Chicago Anthropological Society arose last March and celebrated its first meeting at Field Museum. Most appropriately, this inaugural program was a dialogue presented by Dr. Paul Martin, Chief Curator Emeritus of Anthropology, and Professor Fred Eggan, of the University of Chicago—"Revitalization: the changing course of the anthropological sciences, a retrospect and a prologue to the new Chicago Anthropological Society."

The original C.A.S. was said to have been founded in 1944 by Drs. Martin, Faye-Cooper Cole, Melville Herskovits, and Sol Tax when Martin, at a dinner event, suggested that Chicago's anthropologists ought to get together regularly. Tax, now Professor of Anthropology at the University of Chicago, was thereupon appointed secretary-treasurer and charged with the responsibility of collecting 25¢ dues from all new members.

The membership rose to over 100 by the following year, and before the society became dormant in 1953, its speakers came to include such greats of the anthropological world as Franz Weidenreich, Claude Levi-Strauss, E. E. Evans-Pritchard, Raymond Dart, Raymond Firth, and Monica Wilson.

The dormancy ended this year when several young anthropologists at local institutions, including Field Museum, discovered they shared a sense of need for more communication and community among their colleagues. Membership is already about 100.

The new C.A.S. is indeed a continuation of the original because three members of the new council (to advise and assist on matters of policy and programs) were among the early members of the old C.A.S. They are Drs. Martin, Eggan, and Donald Collier. Joining them are Drs. Charles Reed, University of Illinois Circle Campus, and Francis L. K. Hsu, Northwestern University.

Three of the five young anthropologists constituting the society's guiding administrative committee represent Field Museum's Department of Anthropology. They are John Terrell, Bennet Bronson, and Maude Wahlman. The other two are Don Perrill, Loyola University, and Margo Smith, Northeastern University.

Dr. Reed spoke on "Problems in the Beginnings of Agriculture" at the April meeting, and May 18 Professor William Sumner, Ohio State University, will discuss "Malyan Tepe: developments leading to an early urban center in the Kur River Basin of Iran."

Anyone living within (or beyond) the Chicago area who is interested in further details is invited to get in touch with John Terrell, Department of Anthropology, Field Museum.

## Plans for Exhibit of Contemporary African Art Move Ahead

Maude Wahlman, Consultant in African Ethnology, is spending a month touring many parts of Africa to collect additional materials for the planned new exhibit "Contemporary African Art," now scheduled to open at the Museum in early 1974.

Mrs. Wahlman is also placing orders for a wide range of contemporary African art products to be concurrently offered for sale through the Museum's book shop. Authentic contemporary expressions of the rich art traditions of Africa occur in many forms, including textiles, pottery, jewelry, painting, block printing, etching.

## Women's Committee Keeps Working for Capital Campaign

Following a luncheon hosted by the Women's Committee for the Capital Campaign, committee member Mrs. Hermon Dunlap Smith (center) and Virginia M. Straub visit with Hymen Marx, Curator of Amphibians and Reptiles. This Divison of the Zoology Department, housed on the ground floor of the Museum because of its weight, consists of over 200,000 specimens. It is one of the world's largest and most comprehensive collections and is used extensively by research scientists and graduate students.

# CALENDAR

## Exhibits

Opens May 5

**Seventeen-Year Cicada: A Strategy for Survival,** a multi-media exhibit describing and interpreting the adaptive significance of the unusual life cycle of these strange insects. Millions of cicadas (locusts) are scheduled to make their noisy appearance above ground in the Chicago area in late May or early June of this year. Through July 29. Hall 9.

Closes May 31

**Alexander Wilson's *American Ornithology*.** Copper-plate engravings made for *American Ornithology* (1808), a nine-volume work by the father of American ornithology, Alexander Wilson. Also shown are proofs from the plates recently pulled by Richard A. Davis, Butler University, and George McCullough, Fort Wayne Art Institute, alongside examples of first-edition prints of the same engravings in Field Museum's rare book collection. South Lounge.

Continuing

**Below Man's Vision: Electronic Windows to Unseen Worlds,** an exhibit exploring the world of details in common objects and familiar plants and animals, and offering glimpses into current research activities. Nearly 300 photographs, displayed at up to 200,000 times life-size, introduce a previously unseen world. Through July 15. Hall 18.

**Adaptations of Amphibians and Reptiles,** an exhibit of photographs portraying the natural beauty and esthetic qualities of these animals, as well as illustrating some of their often remarkable and unique adaptations which help them survive. They were taken by Dr. Nathan W. Cohen, Chairman, Department of Continuing Education in Sciences and Mathematics, University of California, Berkeley. Through September 30. Hall 27.

**Color in Nature,** an exhibit examining the nature and variety of color in the physical and living world and how it functions in plants and animals. Continues indefinitely. Hall 25.

**Field Museum's 75th Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Special Events

Sunday, May 6

Peggy Harper, Senior Research Fellow in Dance at the University of Ife, Nigeria, Africa, presents a film lecture "Nigerian Team Dances," at 1:30 p.m. in the James Simpson Theatre.

Saturday, May 12

Sunto Suso of Gambia, West Africa, 21-string kora virtuoso, presents a program of traditional and modern Mandinka music and historical narrative at 1:30 p.m. in the Lecture Hall. He will be assisted by Dr. Klaus Wachsmann's students from Northwestern University.

## Children's Programs

Through May 31

**Spring Journey for Children,** "Life in the Tropical Rain Forest," a self-guided tour encouraging youngsters to learn about the inhabitants of the little-known Amazonian region of South America by exploring Museum exhibit areas. Youngsters are provided with a questionnaire which routes them through Museum exhibit areas. All boys and girls who can read and write may join in the activity. Journey sheets are available at Museum entrances.

## Coming in June

Begins June 1

**Summer Journey for Children,** "Nature Invented It First," a self-guided tour highlighting animals and plants which possess "innovative" features duplicated in human inventions.

## Meetings

May 6: 2 p.m., Chicago Shell Club

May 8: 7:30 p.m., Nature Camera Club of Chicago

May 8: 8 p.m., Chicagoland Glider Council

May 9: 7 p.m., Chicago Ornithological Society

May 9: 7:30 p.m., Windy City Grotto, National Speleological Society

May 10: 8 p.m., Chicago Mountaineering Club

May 18: 7:30 p.m., Chicago Anthropological Society

May 22: 7:30 p.m., Nature Camera Club of Chicago

**May Hours**

Saturday through Thursday, 9 a.m. to 6 p.m.; Friday, 9 a.m. to 9 p.m.

The Museum Library is open 9 a.m. to 4:30 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

Volume 44, Number 6
June 1973

# Field Museum of Natural History Bulletin

**Field Museum of Natural History Bulletin**

Volume 44, Number 6
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Sketches, such as this one by Field Museum's Chief Taxidermist, Ernst A. Gramatzki, help the taxidermist determine the most effective attitude, or pose, of the animal to be mounted.

**2 The Fine Art of Taxidermy**
Ernst A. Gramatzki
a disappearing art flourishes at Field Museum

**6 Members' Nights—1973**
see what you missed?—or did you?

**8 The Botany Dept.—A Short History**
John R. Millar
for the first time, botany became a museum's major scientific division

**13 Capital Campaign**

**14 Field Briefs**

**16 Book Reviews**
**Calendar**

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# the very fine art of TAXIDERMY

By Ernst A. Gramatzki
*Chief Taxidermist*
*Department of Exhibition*

During the Museum's Members' Nights last month, a colorfully unconventional man was pondering one of several skulls sitting around the Taxidermy Division. He looked up and into my eyes—which sit beneath a balding head—and asked, "How do you clean your skull?" It broke me up, and as the visitor puzzled at my reaction I was tempted to reply, "With a washcloth and soap." He finally recognized the ambiguity of his inquiry, and joined in my laughter.

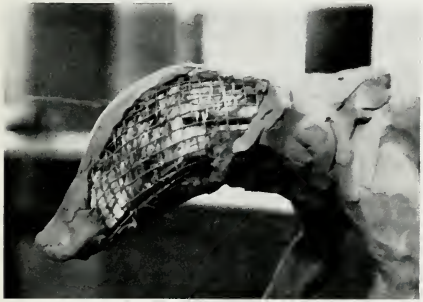
But his interest in what goes on in this room on the Museum's fourth floor is shared by many. The layman finds that what happens behind the scenes is not only interesting, but mysterious: interesting because, somehow, dead creatures are made to look so alive; and mysterious because the visitor begins imagining how exciting it must be to go on collecting trips to far corners of the globe. While collecting trips abroad were quite common at the beginning of the century, when museums obtained most of the specimens they currently display, one is more apt to find today's taxidermist at the local zoo skinning a recently deceased giraffe than on safari in Africa. This is not to say that modern taxidermists never go on field trips, but to point out that many of the Museum's large specimens are much appreciated donations from local sources. The world-famous gorilla, Bushman, is a former attraction of Chicago's Lincoln Park Zoo, and the Giant Panda, Su-Lin, is a donation of the Chicago Zoological Society. Obtaining animals this way helps to conserve the diminishing numbers of live animals in their natural habitats. I hope the day never comes when the only "wildlife" to be found is in the dim halls of a museum.

A mounted mourning dove sits under "wraps" to ensure that the feathers stay in the proper position while the skin dries.

Taxidermy has a long and exciting tradition, especially in the Field Museum. In 1896 Carl Akeley was appointed the Museum's first Chief Taxidermist. His work is known not only through numerous habitat groups

still enjoyed by everyone, but also because of the very up-to-date basic techniques of taxidermy that he employed. His best known contribution to the Museum is probably the Museum's "centerpiece"—the fighting African elephants in Stanley Field Hall. Leon Pray worked with Akeley on many projects, and other past members of the staff, whose works are still on display, include C. J. Albrecht, Julius Friesser, F. C. Wonder, and Arthur G. Rueckert. The Museum's taxidermy studio was the scene of the development of the celluloid reproduction process of taxidermy, or the "Walter's process" in honor of Leon C. Walter. Today, in addition to myself, the division includes Richard Berndt, Assistant Taxidermist and two volunteers, Gertrude Silberman and Louva Calhoun.

Many of us began to work in taxidermy as a hobby, attempting to mount our own hunting and fishing trophies. The more inventive became skilled enough to open their own shops where their sons and other persistent novices picked up the trade by just hanging around and absorbing as much as possible. Some of the most skilled taxidermists were hired by museums where the opportunity to study in detail a vast number of animals helped to further refine their skills. For them, the *continual* study of the anatomy of freshly skinned mammals, birds, fish, and reptiles is a must. They must



The mounting of larger mammals begins by fashioning a wire mesh frame and molding a clay body around it . . .

. . . but since the clay sculpture is too soft to be used as the animal's body, a plaster mold is made from the clay figure.

Using the plaster cast, a papier-mache process is imployed to form the hollow body of the animal. Here the author is seen cleaning the plaster cast after its removal from the clay figure.

The skin of the animal is fitted over the papier-mache form, then sewn closed.

Using both a cat and a raccoon to demonstrate the main steps in mounting small mammals, the taxidermist begins by fashioning a body with excelsior, attached to the animal's skull, then wrapping the excelsior with twine.

The skeletal bones of the limbs are reinforced with wire to keep them in the desired position, and wrapped with twine.

Before the animal's skin is sewn around the limbs, the limbs are covered with a glue that, in the photograph, resembles putty.

know what muscle moves which part of the skeleton; how skeletons function; and how each movement not only changes the outer physical appearance of the animal, but its attitude—its mood—as well.

The taxidermist must also have an in-depth knowledge of how an animal looks and behaves in its natural environment. He can learn this from direct observation in the wild and from spending many hours at the zoo making hundreds of drawings, photographs, and sculptural sketches. It takes constant practice and much time in addition to the regular workday. Most of the taxidermists I know were fortunate to have grown up in the country where the presence of farm animals gave them a basic attitude towards all animals.

Necessary to taxidermy, of course is the handling of a large variety of tools and equipment, and the knowledge of many trades and materials. In spite of this, the taxidermist is still often called a "stuffer," even though the process of "mounting" an animal has nothing to do with stuffing. But there have been people who would use just about any material to stuff their trophies with. There is the story of an amateur who was proud of his first mounted squirrel—until his sister examined the job closely and recognized one of her socks in the open-mouthed creature and demanded that it be returned to her.

Today the taxidermist is required to skin the animal; tan the hide (if it is a mammal); sculpture a clay body; take a plaster mold of the clay model; cast the final form in papier-mache, plaster and burlap, or fibre-glass; and sew and glue the tanned hide around this hollow lightweight but strong form. These are only the main steps.

A method quite different is adopted for small mammals. Parts of the mammal's skeleton, such as leg bones and skull, are used. Excelsior is wrapped around these bones to simulate the muscles and body. This is then covered with a special paste to glue the hide tightly onto the mannikin. Birds are prepared similarly. Wire, cotton, and hemp are used to anchor parts of the legs, wing bones, and skull into a wrapped excelsior body. Fish and reptiles, for the most part, are fibre-glass reproductions, made in a mold taken from the actual specimen. The most tedious part is then painting every scale to match the specimen. But no matter what the animal, they are all fitted with hand-painted glass eyes.

A new method of preservation is by freeze-drying in a vacuum chamber, which extracts the body moisture while the animal is in a frozen state. This method has been satisfactorily applied to insects, plant material, invertebrates, and various reptiles, but I have yet to see a good specimen of a bird or mammal preserved by this method. Yet many museums have had to rely on this method in presenting fauna in their exhibits because of the general absence of trained taxidermists in this country.

Most of the taxidermy profession's finest "artist-naturalist-craftsmen" developed in museums. For the museum taxidermist the art aspect of his training (drawing, sculpture, design, and the ability to visualize) is important as he creates his life-like

The skin is sewn around the four legs and tail. The artificial body is ready to be anchored into position.

With the body in position, the legs and tail are firmly attached to it. The skin is then sewn closed around the body.

After a few finishing touches, the animal looks as alive as though he was preening in someone's living room. This cat, however, is sitting encased in Hall 15.

models and as he relates them to the total exhibit. He often works closely with designers and must be able to visualize how the model fits into the overall scheme of the case or hall. Often his work includes making botanical models to complement his zoological ones, such as plants for birds to perch on. Thus the area of taxidermist and preparator often overlap. The final installation of most groups in the Museum was done by very few people. There were, obviously, a background painter, and one or two taxidermists—one concentrating on animals while the other handled the foreground and needed accessories. Sometimes one person did the entire display.

Today the changing nature of museum exhibits makes the art aspect of taxidermy even more important than it was in the past. Many of the older halls in Field Museum contain collections or groupings of related creatures, or have cases of the "picture postcard" variety. Halls which illustrate a broad overall concept are a modern trend in museum design: "Color in Nature," currently on display, is a step in that direction. Planning this kind of exhibit calls for more imagination and cooperation by script writer, scientist, exhibit designer, and taxidermist than was necessary in the past. Gone are the days when a stuffed duck was just a stuffed duck, placed with so many other stuffed ducks, or set in a case silhouetted against the sunset. Today that duck can be used to illustrate any number of concepts: concealed coloration, sexual plumage, food chains, seed dispersal, etc.

Once the concept has been chosen, the taxidermist must do more than just make the animal look alive; he must decide how to arrange it so that it best illustrates the concept, or message. He must be aware of the visual potential in a proposed display. His training as an artist, plus his sense of the dramatic, tell him that a cheetah in action, in pursuit of its prey, will make a far more interesting display than the big cat just sitting there with its kill. Furthermore, it will demonstrate speed, the cheetah's unique characteristic. Thus it is very important for the taxidermist to examine the many design possibilities, such as setting and pose, for a creature before mounting it for a specific display. The animal must be arranged in an interesting and artistic, as well as realistic, manner.

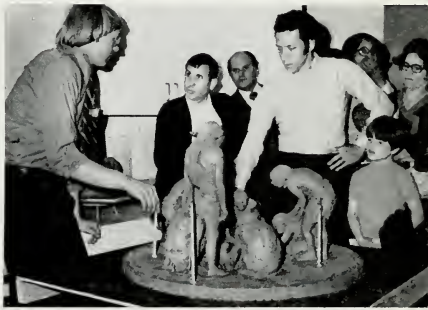
Perhaps it is this versatility required, plus the long training time, the lack of places to train, and the hesitance of some "old-timers" to share their knowledge, that account for the current lack of highly skilled taxidermists. To my knowledge there is no place in the United States where a prospective taxidermist can get the type of training outlined in this article. Museums and commercial firms are seeking good taxidermists. If a comprehensive training program were to be organized the prospect would brighten that museums and other institutions would be able to find qualified taxidermists. Until such time the field for the skilled taxidermist is wide open.

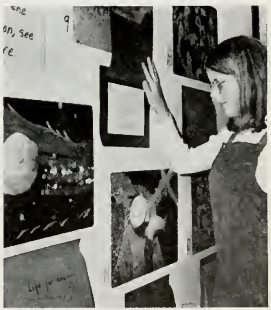
Oh—and as to that question about how to clean a skull: remove the flesh from the bone (dermestid beetles will finish the job for you), then bleach and degrease it. Any more questions?

# Members' Nights

Were you among the 6,933 who enjoyed the exotic entertainment, refreshments, demonstrations, and a look "behind the scenes?"

MAY 3 & 4





# The Botany Dept.— A short History

## By John R. Millar

*With this article we complete our presentation of the histories of the four scientific departments. John R. Millar, former Deputy Director of the Museum and Chief Curator of Botany, has often been considered the Museum's unofficial historian because his tenure began before the Museum moved to its present home in 1921. In fact, all indications are that the initials of the "young preparator" he mentions who used roller skates to help in the move were J. R. M. Millar is now enjoying his retirement in Florida.*

The Department of Botany, like the Museum itself, arose Phoenix-like from the ashes of the World Columbian Exposition in 1893. It was the composition of those ashes that determined the nature of the Museum at first. Never before that time had any museum considered botany as a major division of its organization. Men of diverse interests and backgrounds were the prime movers in promoting and organizing the exposition. In 1885 the directors of the Chicago Industrial Expositions met and passed a resolution, "that it is the sense of this meeting that a Great World's Fair should be held in Chicago in 1892, the four hundredth anniversary of the landing of Columbus in America." It is safe to assume that the authors of the resolution were thinking in terms of industrial enterprise and materials to sustain it. However, there were at the same time in Chicago a number of wealthy, traveled persons who were collectors of art and cultural things who recognized the merit of an international exposition and the opportunity it afforded to establish a great museum with selected exposition exhibits.

An oft-mentioned article by Professor F. W. Putnam of Cambridge, Massachusetts, printed in the *Chicago Tribune* of May 31, 1890, is generally regarded as the first published account advocating the creating of Field Museum. Actually, he, being an anthropologist, proposed the establishment of a great ethnological museum that would be a world center for the study of native peoples of the western hemisphere. Other persons of other interests also envisioned a permanent museum as an aftermath of the exposition. Three directors of the exposition took it upon themselves to call a meeting of leading Chicagoans for the purpose of incorporating a museum. This was accomplished in September 1893 just before the close of the exposition. It triggered energetic efforts to solicit gifts of materials from various nations and individuals exhibiting at the fair.

Dr. Frederick J. V. Skiff, in the Museum's first published report in Volume I of the Historical Series, said, ". . . while no great public acts nor unified labor were apparent, many men, each in his own field, largely by his own volition, were sincerely enlisted; [to the end] that there was generous and energetic cooperation in gathering material, making purchases and securing funds."

### Collecting begins

Dr. Charles F. Millspaugh, a homeopathic physician by formal training but an avid botanist and naturalist by avocation, who in 1887 published his work on American medicinal plants, served as superintendent of the West Virginia exhibits at the fair and also on its jury of awards. W. G. Buchanan, chief of the exposition's departments of agriculture and forestry, which included the West Virginia exhibits, appointed Dr. Millspaugh to solicit donations of collections to the Museum. The response was most gratifying. Collections of gums, resins, fibers, oils, waxes, tannins, dyes, starches, cereals, sugars, spices, medicinal plants, timbers and cabinet woods were generously offered by twenty or more countries. Many artifacts and industrial products were included. In some instances exhibitors had made earlier commitments to give others "portions at least" of certain valuable timbers. Dr. Millspaugh saved the situation by obtaining a bandsaw to divide the logs so that promises to all could be kept. In this manner the Department of Botany began with one of the largest and finest collections of woods and forest products extant anywhere. This resourcefulness and energy characterized Dr. Millspaugh's subsequent activities when he became the first appointee to the scientific staff of the Museum as Curator of Botany. Donated and purchased materials were moved to the Palace of Fine Arts building as they were released by exhibitors.

Museum organization at first included not only the present-day departments of anthropology, botany, geology, and zoology but also ornithology, as separate from zoology, and industrial arts, including transportation and the Department of Columbus Memorial. The Department of Botany was assigned space on the galleries, or balcony, that extended around the great courts on the second floor level. The

courts can be visualized as two Stanley Field Halls intersecting at right angles, the midpoint marked by a large domed rotunda. It was on these second floor galleries that Dr. Millspaugh quickly installed his exposition loot, much of it still in the cases in which it had been exhibited at the fair. Many large items, timbers and artifacts were on open display. Because gifts of botanical specimens had been donated by particular countries, it was most expedient to arrange exhibits on a geographical basis. This led to much duplication of specimens because the same kind of thing occurred in, and was exhibited by, each of several countries. After the rush to open the Museum on June 2, 1894 was over, it became evident that an arrangement based on plant family relationships and by category of material would be preferable, but not much could be done about effecting the change until 1900. In the interval three styles of exhibition case had been designed by Dr. Millspaugh to meet his by then experienced approach to the problems of botanical exhibition. A few prototypes were delivered for use in the first revision of botanical exhibits, a process that keeps repeating. These are the kinds of cases in which botanical exhibits are now housed; strong, well-built, solid birch furniture intended to last forever to accommodate exhibits in the fashion in vogue in the early 1900s. The original natural blond birch finish was to be changed a score of years later after the move to the present building.

**Inherent problems**

Exhibition cases were only one of a multitude of difficulties that confronted the Department of Botany. The building had no heat during the winter of 1893-94, when exhibition materials were being moved in, since it was never intended to be a permanent structure. Before the next winter set in, three 100-horsepower steam boilers, seventy radiators, and electric generators capable of operating forty 1,200-candle-power arc lamps were installed—the last intended only for use in patroling the building at night. Dr. Skiff noted in the Museum's first Annual Report, for the year 1894-1895: "It was found impossible to heat the four great courts with their height of seventy-eight feet and it was an almost hopeless undertaking to warm the eighty spacious doorless halls. But necessity compelled a means. The entrances to the halls leading from the courts and leading in and out of the long narrow annex passages were fitted with large movable partitions filling the entire space in which doors were constructed. By this means all the exhibition halls were enclosed, and being provided in each case with ample radiation, a minimum temperature of 55 degrees was ordinarily maintained throughout the building. The courts are treated as streets and visitors seem to readily adapt themselves to this condition of affairs. This arrangement practically closes the Department of Botany during the colder months of the winter season; it is impossible to view the collections there with any satisfaction."

Adapting a temporary structure to

**The excellent wooden herbarium cases designed by Dr. Millspaugh are still in use. This 1909 photo was taken in the Museum's first home, the Palace of Fine Arts of the 1893 Columbian Exposition.**

**The Museum's first herbarium specimens were collected by Dr. Millspaugh during an 1894 expedition to the Yucatan. This mode of transportation is still necessary today in some otherwise inaccessible parts of the world.**

In 1918 the author (left, eating sugarcane) and three other members of the Mrs. Stanley Field Plant Reproduction Laboratory, spent the winter in Florida among subtropical exotic plants. Others making the trip in this 1917 Model T touring car were Homer A. V. Geib (center), Museum Preparator; Mr. Charlesworth, a glassblower; and the man who snapped this rare photograph, Dr. B. E. Dahlgren, then the Museum's Assistant Curator of Economic Botony.

The coconut palm from which the Museum's model in Hall 28 was made was collected by Millar during the expedition in Florida in 1918.

permanent use as a museum brought to the surface another chronic and incurable museum ailment—lack of space where and when it is needed. "The small rooms . . . in the second galleries [third floor] of the courts have by force of circumstances been preempted by the Curators of Botany, Zoology and Ornithology for laboratories, by a poisoning and disinfecting laboratory, by guards and by departments of printing and photography. These twelve rooms are already inadequate . . . and more room for working is already one of the great needs of the Museum." At this time a warehouse was acquired at the corner of 56th Street and Jefferson Avenue "to provide room for storage and for carpentry, modeling, plaster work, and for taxidermy, three kinds of labor which could not be permitted within the Museum building as at present arranged."

**Early field trips**

Although no herbarium specimens were included in material received from the exposition, no time was lost in starting a collection. The first specimens were collected by Dr. Millspaugh on a trip to Yucatan as the guest of Allison V. Armour in 1894. How the herbarium grew to become one of the world's major collections of Central and South American plants was related last year in the April issue of the *Bulletin*. I will add here only the following statement from the Museum's Annual Report for 1899-1900 because it records a prophecy that has turned out to be all too true: " . . . Preparator Lansing . . . has continued his collection of plants of the Chicago Basin. This work is particularly important as not many years hence nearly the whole distinctive plant life of the section . . . will become extinct through drainage and reclaiming of land and the extension of the City of Chicago and surrounding suburban towns." Such changes are now recognized as national and international concerns; both plant and animal species are vanishing at an accelerating rate.

Displays of dried plant materials can be most uninteresting and dreary if they are not relieved by some semblance of realism and life. This is especially true when characteristics of a plant family are to be portrayed. Dr. B. E. Dahlgren, a doctor of medical dentistry, gave up a practice in orthodontia to become Assistant Curator of Invertebrates at the American Museum of Natural History, where his superior skill in making models of lower invertebrates, insects, and plants earned high praise. In 1909, he was induced to join the staff of the Department of Botany to undertake to illustrate each of the major plant families by means of life-like models of representative plants and enlarged models of their flowers to show important anatomical details. This enterprise, which was largely financed by Museum President Stanley Field, eventually produced what is often acclaimed as the world's finest botanical exhibition in a museum.

Money problems caused a hiatus in the program for about three years prior to 1917. In 1918, a year after operations resumed, a shortage of coal during World War I required the Museum to curtail its use. So in October the Mrs. Stanley Field Plant

Reproduction Laboratory staff of four persons moved to Miami, Florida in a Ford touring car. Dr. Dahlgren, the leader, had by then acquired the title of Assistant Curator of Economic Botany. Sleeping and working quarters were provided by the Bureau of Plant Introduction of the U. S. Department of Agriculture at its station and garden on Brickel Avenue, since sold and now occupied by residences. The sojourn in a winter vacation land was sheer delight for the four Chicagoans but living on the job resulted in a greatly lengthened work day and week which made the escape from frigid working quarters highly productive of useful studies, molds, finished models, and pickled plants for later use. Subtropical exotic plants such as the banana, pineapple, coconut, natal plum, silk cotton tree, and many others were obtained for exhibition purposes.

**Moving to new quarters**

On return to Chicago at the end of May 1919, the immediate task of the staff was to prepare or pack all exhibition material for moving to the new Museum building. Procedures were carefully worked out to assure that all items were identified and designated as to placement in their new home. This included exhibition cases, which because of their great size and weight required four-man moving teams and hopefully, therefore, could be placed precisely in their permanent positions to avoid later moves. Martin Kennelley, later to become Mayor of Chicago, was a partner in the firm that was given the moving contract. In the actual move botany exhibition cases were lowered from the second floor gallery to the main floor by means of an inclined tramway powered by windlass and muscle. From there they were loaded into freight cars on a spur track of the Illinois Central Railroad and taken to the new building where another spur track had been constructed. Botanical exhibits were to occupy five halls on the east half of the second floor, which required the use of the freight elevator on the south side of the building to get them there. Unrecorded history has it that the young preparator who was given the task of meeting teams of movers coming up the elevator with cases, directing them to the proper hall, then going to the hall and indicating the exact location, used roller skates to go back and forth quickly. Elaboration of this circumstance had the young man speed around a corner, bump into the director, who was on a tour of inspection, and nearly knock him down. This was supposed to have resulted in an official order to cease the use of roller skates in the Museum. Actually the cases had all been placed before, and the order was issued because of a lack of confidence in the skill of the skater and the danger of breaking glass in exhibition cases through collision.

Early in the development of botanical exhibits the question of properly labeling the economic collections was resolved and led to a unification of style throughout the botanical section and eventually the entire Museum. Dr. Millspaugh said, "From observation at various times of the movements of people who were examining the collections, it would seem the first impulse . . . is that of curiosity, the second of interest and the third, a desire for education. It was decided that the installation of a case should be such as to attract attention to it as a whole. The principles in such an installation are, as I take it, a neat and well ordered arrangement of specimens. . . . It is important that labels should be of such character as to invite reading; plainly typed and condensed; comprehensible to the average citizen rather than abtrusely scientific; short, pithy and direct. Having arrived at these conclusions . . . it was decided that the best background to form a general setting for the contents of a case should be dead black and the label the same, printed in some ink just off the contrast that white would make. This ink proved to be aluminum."

". . . It was decided that the best background to form a general setting for the contents of a case should be dead black and the label the same, printed in some ink just off the contrast that white would make. This ink proved to be aluminum." It took years of effort to overcome administrative opposition to a change to more cheerful background colors.

When the botanical exhibits were placed in their bright, clean, new home it became very apparent that case interiors and labels were in truth "dead black" and contributed greatly to what has been called the "gloom of the museum." Stanley Field in later years said that the decision to adopt black for case interiors and label stock throughout the Museum had been reached at a conference of the heads of departments and the Museum architect in his office in spite of his misgivings about the matter. However, the move to change to more cheerful background colors met with administrative opposition and trial revised installations had to be made surreptitiously with materials obtained at personal expense. When the merit of less somber installations was finally recognized and approval given, it took a tremendous amount of time and labor to effect the change.

Firm establishment in permanent, new, uncramped quarters seemed to motivate the staff to meet the challenge

of a bright future. The next few years saw growth and development in all phases of departmental operations. Expeditions to collect material for exhibition went to British Guiana (now Guyana), to Brazil, to the Rockies, to the eastern seaboard, the Pacific Coast States, to Florida and to Michigan. Outstanding habitat groups showing alpine flowers, midwest forest plants, intertidal marine vegetation, and some Amazon River plants were produced with material thus obtained. In addition many models of individual plants such as the cannonball tree were made to represent certain plant families in the systematic series.

**The early collectors**

These were accomplishments that could be seen and appreciated by Museum visitors, but perhaps the most important achievements of the department have been in the field of taxonomy and floristics. From the very first year of its existence, members of the staff seized every opportunity to collect plants for study and deposit in the herbarium. Beginning with Dr. Millspaugh's collections from Yucatan, and the persistent work of O. E. Lansing in collecting plants of the Chicago area, each member of the staff made his contribution according to his own talents and special interests. Dr. Jesse M. Greenman left the Gray Herbarium of Harvard University to become Assistant Curator of Botany. From 1904 to 1912 he collected extensively in Mexico and Central America and published in the *Fieldiana: Botany* series. He resigned to join the staff of the Missouri Botanical Garden. Huron H. Smith, who from 1911 to 1914 diligently photographed and collected North American trees from the southeastern United States to the Pacific Northwest, did most to create the Museum's fine exhibit contained in Hall 26. J. Francis Macbride joined the staff in 1922. He, too, came from an internship at the Gray Herbarium. His field work in Peru led to one of the department's

Backed by the old herbarium cases, Dr. Paul C. Standley makes notations on recently mounted specimens. Photo was taken about 1940.

major floristic works, the *Flora of Peru*, which already consists of several thousand printed pages and will have many more when completed by others. (Macbride retired in 1963.) As mentioned elsewhere, he also selected and supervised the photographing of type specimens of American plants in European herbaria. His bibliography lists more than fifty titles.

Dr. Paul C. Standley came from the U.S. National Herbarium in 1928 to join the staff as Associate Curator of the Herbarium. His extensive field work in Mexico and Central America resulted in a number of Museum publications. Among the more notable are the *Flora of Lancetilla Valley* (Honduras), *Flora of Costa Rica*, *Studies of American Plants*, *The Rubiaceae of Colombia*, also *of Ecuador*, *of Bolivia*, and *of Venezuela* for a total of 2,881 printed pages. Then in 1946 he began the *Flora of Guatemala*, which, by the time of his retirement in 1950, had been issued in four parts totaling 1,868 pages. A prolific author, Standley's bibliography lists more than 250 titles. The energy, competence and productiveness of Standley is almost legendary. It earned him the profound respect of his colleagues and an enduring place in the history of American Botany. He was small, thin, a chain smoker, quick in his movements, incisive in his thinking and decisive in his work. He died in 1963 at age eighty in Tegucigalpa, Honduras, where he had gone to live after his retirement.

Dr. Julian A. Steyermark joined the staff as Assistant Curator of the Herbarium in 1937. He did extensive field work in Missouri and later wrote the *Spring Flora of Missouri*. Further field work in Guatemala and Venezuela led to his collaboration with Dr. Standley on the *Flora of Guatemala* and later to his 1,195-page work *Contributions to the Flora of Venezuela*. In 1959 he joined the faculty of the Instituto Botanico of the Ministerio Agricultura y Cria at Curacas, Venezuela.

These were staff members of the Department of Botany who in their time made important contributions to our knowledge of plants of the New World tropics. There were others who for shorter periods and in different ways used their special talents to make the department a viable, effective part of the Museum organization. One of these, Dr. Theodor Just, Chief Curator of the Department from 1947 until his death in 1960, was especially well known for his numerous publications in the field of paleobotany.

This leads us up to the present staff of equal competence who are continuing to focus attention on the neotropics. Why? one may ask. The answer seems to be because of the challenge of the unknown, because our ignorance of the vegetation of that part of the world was abysmal and is less so now because of the Museum's research program. Nevertheless, it still remains great. It is also believed that some of the larger problems of plant systematics, phylogeny, and evolution may find answers as our study of particular plants progresses.

Visitors to the Museum's exhibit, "Below Man's Vision: Electronic Windows to Unseen Worlds," have discovered the marvels of scientific photography made possible by the scanning electron microscope. Soon Field Museum scientists' research will benefit from this microscope. The southwest corner of the third floor, currently being remodeled, should be ready to receive the new instrument in June. Parts of the microscope have already arrived at the Museum.

During Chicago's spring cold spells, some Museum work areas have found themselves without heat. But employees have consoled themselves with the knowledge that this temporary discomfort was due to a major improvement that has begun, the conversion of the present coal-fired boilers to a gas or oil capability. The conversion is expected to minimize air pollution, and the system should be ready for the first cold spell of the fall season.

Another project, due to begin momentarily, is the rehabilitation of the north and south exterior stairs, which will take about one year to complete. The rebuilding will result in less costly maintenance and the prevention of the stairs' eventual collapse.

Concurrent with this project, eight new emergency exits will be built to meet a building code requirement. There will be four each on the north and south sides of the Museum, on the stairway landings between the ground and first floors.

As Members' Nights attendees already know, the Department of Exhibition is enjoying renovated quarters that better accommodate its staff and ensure efficient and expanded operations.

These are just a few of the many projects to be undertaken that will permit the Museum to better serve all of its visitors and at the same time enhance its scientific endeavors. They will ensure that Field Museum will retain its position among the world's leading scientific, educational, and cultural institutions.

## Where is the Money Going?

Like ants putting their "homes" in order, workers can be observed inside and outside the Museum as efforts to update and improve the building and services continue at an accelerating pace. These activities are being made possible through the generosity of old and new friends of the Museum, who, to date, have contributed just short of $10 million to the Museum's $25 million Capital Campaign.

The campaign, launched in September 1971 by the Museum's Board of Trustees, has as its goal the generating of $12.5 million from private gifts, to be matched by $12.5 million through the bonding authority of the Chicago Park District. It is the first such campaign in the Museum's history. Previously, the Museum has elected to use its income principally in meeting the growing demands of collection, research, exhibits, and educational services to the public. Consequently, repairs are needed and improvements have always taken a back seat. These problems, related in past issues of the *Bulletin,* can no longer be ignored.

A portion of the funds already raised is being employed to satisfy several of the Museum's needs. Tuckpointing of the building's exterior was begun last year, discontinued through the winter, and begun again in April. The job is expected to be completed by fall.

**Workmen are making seams watertight by filling them with a waterproofing material. It's one of several projects Capital Campaign funds are making possible.**

# FIELD BRIEFS

## 180 Cited on Traveler Day

Field Museum honored 180 youngsters on Museum Traveler Day, April 28, for successfully completing the various categories in the Museum's Journey Program. Of the 180, 123 participated in the awards ceremony in the James Simpson Theatre, where, after the presentations, a color motion picture, "Kenya-Uganda Safari," was shown.

Fifteen children were eligible for membership in the Museum's Discoverers' Club after participating in 16 journeys and a special "Voyage of the Beagle" journey. Club membership entitles them to free admission to the Museum until age 18. In other classifications, 19 became Beaglers after completing 16 journeys; 19 were named Explorers for 12 journeys; 40 were designated Adventurers for 8 journeys; and 87 were recognized as Travelers for 4 journeys.

The program, featuring four journeys each year, is organized by the Museum's Department of Education. The self-guided tours are designed to acquaint children who can read and write with a variety of exhibits.

## Hummer Named Project Manager

Paul Hummer has joined the Museum's staff as Project Manager of the "Man in His Environment" program, tentatively scheduled to be ready for presentation to the public in Fall 1974. Hummer, who received his Master of City Planning degree from the University of Pennsylvania, was most recently with the Pittsburgh Model Cities Program. There, he was concerned with research in urban programs, especially in education and community arts.

## Turtle Named for Zangerl

A land Tortoise, extinct for 110,000,000 years and first discovered only a few years ago by a joint Polish-Mongolian fossil-collecting expedition in Mongolia, has been given the scientific name *Zangerlia testudinimorpha*, to honor Dr. Rainer Zangerl, Chairman of the Museum's Department of Geology. The turtle was named by Dr. Marian Mlynarski of the Polish Academy of Science in recognition of Dr. Zangerl's international reputation as a student of fossil turtles.

## 25 Years Ago: June 1948

Newspapers were having a field day (no pun intended) with photographs of the Museum's "terror bird," a 5-foot, life-size reproduction of *Mesembriornis*, a nightmarish and carnivorous extinct bird. It had been recently placed on display, and today is found in Hall 21. . . . Marie Svoboda, now Raymond Foundation Coordinator in the Museum's Department of Education, delivered a lecture-tour on "What to Wear—Unusual Materials Used in Clothing." . . . A model of the earth's interior was placed on exhibition in Hall 29, where it still receives visitor interest. . . . Gifts to the Museum's Department of Zoology included 25 frogs, 10 snakes, 14 fish, 87 salamanders, 5 lizards, 8 crabs, a black bear cub, a Chinese turtle, and a tree shrew.

## Stanton R. Cook Named Trustee

Stanton R. Cook, publisher of the Chicago Tribune, was elected Museum Trustee at the April meeting of the Board of Trustees. Cook, who joined the Tribune in 1951, is also President and Chief Executive Officer of the Chicago Tribune Co. and Vice President of its parent organization, Tribune Company. Born in Chicago, Cook was graduated in 1949 from Northwestern

## Environmental Program Gets Financial Boost

Financing of the Museum's "Man in His Environment" program, to begin in fall 1974, got an added boost with a $60,000 grant from the Graham Foundation for Advanced Studies in the Fine Arts. Viewing one of the program's future exhibit inhabitants and a display model are Foundation President Charles F. Murphy Jr., senior partner of the architectural firm C. F. Murphy Associates, and Museum Director E. Leland Webber. The public education program will consist of a major museum exhibit, a traveling version of the exhibit, publications, films, and lectures.

Stanton R. Cook

University. During World War II he served as a navigator with the United States Army Air Corps. He is also a trustee of the University of Chicago and a member of the Board of Directors of the Bureau of Advertising of the American Newspaper Publishers Assn. He served as President of the Chicago Newspaper Publishers Assn. for two years.

## Archaeology Program To Begin

The prehistory of the American Southwest will be the focus of attention by 12 college sophomores and juniors for 10 weeks beginning June 8, when the Museum's "New Perspectives in Archaeology" program gets underway at its field station near Vernon, Arizona. The tuition-free course emphasizes practical and theoretical archaeology, and includes the excavation and reconnaissance of sites that are estimated to have been inhabited from about 1000 B.C. to 1500 A.D.

Under the direction of Dr. Paul S. Martin, Chairman Emeritus of the Museum's Department of Anthropology, each of the participants will be asked to devise and execute an independent research project. This involves the generation of an hypothesis, the collection and testing of data, and the preparation of a paper covering the research topic. The program is being financed for the ninth consecutive year by the National Science Foundation.

## African Music, Dance Offered

Programs centered around the music and dances of Africa were presented at the Museum during May. On the 6th, Peggy Harper, Senior Research Fellow in Dance at the University of Ife, Nigeria, Africa, presented a film, "Nigerian Dance Teams," followed by a discussion period and lecture. She also conducted a workshop for dance groups later in the day.

On the 12th, Sunto Suso of Gambia, West Africa, who is a virtuoso of the 21-string kora, presented a program of traditional and modern Mandinka music and narrative. The kora, a combination of a harp and a lute, was developed to its present form in West Africa. It is usually played singly or in groups, but not in concert with other instruments.

## Women's Board Elects Officers

The election of officers, a luncheon, and a panel discussion were among the events that took place during the annual meeting of Field Museum's Women's Board, May 8.

The election of officers was conducted in the President's Room of the Museum. The following were elected: Mrs. B. Edward Bensinger, President; Mrs. Frank D. Mayer, Mrs. Joseph E. Rich, and Mrs. Harold F. Grumhaus, Vice Presidents; Mrs. Thomas E. Donnelley II, Recording Secretary; Mrs. Carroll Sudler, Corresponding Secretary; Mrs. Robert E. Straus, Treasurer; Mrs. Edward F. Blettner, Assistant Treasurer; and Mrs. James W. Alsdorf, Mrs. Edward McCormick Blair, Mrs. Frank O. Wetmore, Mrs. Henry P. Wheeler, and Mrs. Philip K. Wrigley, Board Members at Large. Mrs. Elliott Donnelley was Chairwoman of the Nominating Committee.

Following the election of officers, Museum Director E. Leland Webber moderated a panel discussion on the subject of "The Museum as a Center for Scientific Research." Participants included Dr. Robert F. Inger, Assistant Director, Science and Education; Dr. Rainer Zangerl, Chairman, Department of Geology; and Dr. Rupert L. Wenzel, Chairman, Department of Zoology. The luncheon was then held in one of the Museum's handsome botanical halls.

The chairwomen of the board's standing committees have also been named. They are: Mrs. Bowen Blair, By-laws; Mrs. Edward Byron Smith, Liaison with Building Committee; Mrs. Corwith Hamill, Liaison with Capital Campaign; Mrs. Edward F. Swift, Lists and Files; Mrs. J. Harris Ward, Membership; Mrs. Gaylord Freeman, Nominating; Mrs. Wallace D. MacKenzie, Program; Mrs. William Wood-Prince, Publicity; Mrs. Cameron Brown, Social; Mrs. Richard Oughton, Volunteers; Mrs. A. Watson Armour, III, Plants; and Mrs. Arthur S. Bowes, Special Events.

## University Club Cites Webber

A highlight of the annual Women's Board meeting was the presentation to Museum Director E. Leland Webber (left) of a citation from the University Club. Frank A. Reichelderfer, President of the club, congratulated Webber for his "outstanding contribution to the cultural life of Chicago." The award is given annually by the club for exceptional community service.

## French Paleontologist Visits

A French flag flying in front of the Museum recently greeted visiting paleontologist Dr. Cecile Poplin, who with her husband, Dr. Francois Poplin (right), an anatomist, visited with Dr. Rainer Zangerl, Chairman of the Museum's Department of Geology. Drs. Poplin, from the National Museum of Natural History in Paris, were here to study some of the Museum's collections.

**American Indian Art**

By Norman Feder. New York: Harry N. Abrams, Inc., 1969. (Printed and bound in Japan.) 445 pp.; illustrations; map. $35.

A notable recent phenomenon in the art world has been widespread interest in art from all regions of the world. Ethnic art has been the subject of steadily increasing attention on the part of both art museums and private collectors and examples now bring fabulous prices from dealers or at auctions where formerly such objects were either ignored entirely or could be obtained very cheaply. Interest in the art of North American Indians has been an important aspect of this new enthusiasm and has resulted in the publication of numerous books, most of them of coffee table size and design, on the subject. Many of these are organized in an unimaginative manner and discussion of the objects chosen for illustration is superficial. These are criticisms that cannot be leveled at this fine book by Norman Feder, Curator of American Indian Art at the Denver Art Museum.

The scope of Feder's book is restricted to historic art from North America north of Mexico and there are 242 black and white illustrations together with 59 color plates. Although the author believes that Indian art can be judged and appreciated by Western standards, he also stresses the fact that knowledge of the cultural context of an object greatly enhances one's appreciation as well as understanding.

In his introductory chapters, Feder discusses the difficulty of identifying tribal styles primarily because of lack of documentation for specimens in museums and private collections. He also notes the importance of copied European styles and introduced European tools and materials. Other subjects dealt with briefly but with considerable insight include motivations for artistic decoration, the relationship of ecology to art, the artist as a specialist, and the commercialism that is characteristic of most recent American Indian art. Unlike many contemporary observers, Feder believes that the prospects for a viable Indian art in the future are good and will, under the most favorable circumstances, result in a vigorous development of new forms based on old traditions.

The largest part of the book is devoted to a consideration of Indian art by culture areas. The major styles of each area are discussed in some detail with illustrations keyed to these discussions. Feder's treatment of the cultural and economic resources of the various areas is, of necessity, less detailed and there are some inevitable over-generalizations. The author's culture areas include the Plains, Southwest, Great Basin and Pacific Plateau, Northwest Coast, Arctic Coast, and Woodlands. As might be expected, heaviest emphasis is on the Plains, Southwest, and Northwest Coast areas where Indian art was highly developed and examples are abundant in museums and private collections. In addition to the art objects, black-and-white photographs include some historical scenes of Indians and their lifeways. Feder illustrates 16 specimens from Field Museum collections, 12 of which can be seen by visitors in the American Indian halls on the main floor. These include a beautiful Tlingit Chilkat blanket in Hall 10, a Cheyenne painted parfleche (Hall 6, case 22), and an elaborate Arapaho Ghost Dance dress (Hall 5, case 32).

The quality of objects selected for illustration in this excellent book is so high, the scholarship so sound, and the work so beautifully produced that criticism somehow seems out of place. There are, however, some minor errors (at least one wrong catalogue number), and, inevitably, a few of the provenience attributions are questionable. In a work of this kind, it is always possible to question the author's selection of objects to be illustrated. My own particular preference would have been for the inclusion of the art of Northern Athapaskan Indians with illustrated examples of their quillwork designs, the most intricate in North America.

In an era of expensive and ponderous coffee table books, this one is likely to make both your pocketbook and the table groan. Nevertheless, it is a marvelous book both for the sophisticated student of art and the novice seeing for the first time the superb achievements of North American Indian artists.

*by Dr. James VanStone, Chairman, Department of Anthropology, Field Museum.*

**The Colorful Mineral Identifier**

By Anthony Tennissen, Photographs by Werner Lieber. New York: Sterling Publishing Company. 120 color plates. $3.50

Amateur mineral collectors repeatedly ask why it is not possible to have a book published on mineral identification that just simply tells how to identify minerals—no fancy stuff—just straightforward facts. They frequently cite any of the numerous good books on bird identification as examples of the kind of book they seek but do not find on the bookstands. Why no such book has appeared is simple—it is impossible. The reasons are numerous and can't be gone into in detail here. Suffice to say, if minerals were like birds then it would be possible. Each species of bird has, within pretty narrow limits, relatively constant adult size, coloration, body form or shape, habits, and habitat. This is not true of any mineral.

Because the mineral collector constantly seeks such a cut-and-dried book, publishers are constantly attempting to supply it—they themselves unaware of the difficulties. The result is a plethora of books on the market that promise a great deal, but fail, in varying degrees, to satisfy the demand. *The Colorful Mineral Identifier* is unfortunately [again] just such a book. Any untutored amateur, armed with this book, will find it hopeless as a means to identify most of the minerals he encounters.

One of the main complaints of amateurs

with books already on the market is, "I never collect minerals that look anything like the pictures in the books." The reason is simple. Most amateurs are able to collect mainly fairly run-of-the-mill specimens of a few dozen of the very common minerals. When specimens are chosen for book illustrations, however, authors almost always choose nice-looking to fabulous-looking specimens; and in order to offer enough pages they usually include minerals the amateur is never likely to encounter in the field. The specimens shown in this book were clearly chosen for these same reasons. The text, on the other hand, is weak. Each page of text is a strict, rigid format of: name, composition, crystal system, hardness, specific gravity, etc., etc., ending with a generalized list of localities that is useless for an amateur collector. What the text does is to touch all bases; it duplicates the descriptive texts of hundreds of mineral books and mineralogy texts of several previous generations.

Thus, as a book for the beginner to use in mineral identification it is, in the estimation of this reviewer, a flop. This is not to say, however, that it is totally without any merit. The 120 color photographs by Werner Lieber are excellent. Although not printed on glossy stock, the color rendition is sharp, bright, and the hues quite true—a tribute to an unnamed professional who prepared the color separations with pride and obvious skill. The specimens illustrated consist mostly of small, down to microscopic, size crystals. In each case they are attractive, well-crystallized, and of the best color known for each mineral.

It is unfortunate the author and publisher chose to call this book *The Colorful Mineral Identifier*. Had they simply called it *The Colorful Mineral Book*, without the implied promise of help to the novice, and included a text that pointed up distinctive features (not necessarily the same routines ones) of each mineral, it would have received an unqualified recommendation from this reviewer. Even at that, if you are deeply interested in mineral collecting, at any level, it is a worthwhile purchase for the 120 fine color photographs at an unbelievably low price of $3.50. Even though the plates are of fairly small size, 2¾ inches by 4 inches, they are well worth the price. In these days, such bargains are few.

*by Dr. Edward Olsen, Curator of Minerology, Field Museum.*

# CALENDAR

## Exhibits

Continuing

**Below Man's Vision: Electronic Windows to Unseen Worlds,** an exhibit exploring the world of details in common objects and familiar plants and animals, and offering glimpses into current research activities. Nearly 300 photographs, displayed at up to 200,000 times life-size, introduce a previously unseen world. Through July 15, Hall 18.

**Seventeen-Year Cicada: A Strategy for Survival,** a multi-media exhibit describing and interpreting the adaptive significance of the unusual life cycle of these strange insects. Millions of cicadas (locusts) are scheduled to make their noisy appearance above ground in the Chicago area around June 1. Through July 29. Hall 9.

**Adaptations of Amphibians and Reptiles,** an exhibit of photographs portraying the natural beauty and aesthetic qualities of these animals, as well as illustrating some of their often remarkable and unique adaptations which help them survive. They were taken by Dr. Nathan W. Cohen, Chairman, Department of Continuing Education in Sciences and Mathematics, University of California, Berkeley. Through September 30. Hall 27.

**Color in Nature,** an exhibit examining the nature and variety of color in the physical and living world and how it functions in plants and animals. Continues indefinitely. Hall 25.

**Field Museum's 75th Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Children's Programs

Begins June 1

**Summer Journey for Children, "Nature Invented It First,"** a self-guided tour highlighting animals and plants which possess "innovative" features duplicated in human inventions. Youngsters are provided with a questionnaire which routes them through Museum exhibit areas. All boys and girls who can read and write may join in the activity. Journey sheets available at entrances.

## Meetings

June 10: 2 p.m., Chicago Shell Club

June 12: 7:30 p.m., Nature Camera Club of Chicago

June 13: 7 p.m., Chicago Ornithological Society

June 13: 7:30 p.m., Windy City Grotto, National Speleological Society

June 14: 8 p.m., Chicago Mountaineering Club

June 26: 7:30 p.m., Nature Camera Club of Chicago

## Coming in July

Children's movies at 10 a.m. and 1 p.m. on Thursdays in the James Simpson Theatre.

## June Hours

9 a.m. to 6 p.m. Saturday through Thursday;
9 a.m. to 9 p.m. Friday.

Beginning June 23 and continuing through September 2, the Museum will be open from 9 a.m. to 9 p.m. on Wednesday, Friday, Saturday and Sunday.

The Museum Library is open 9 a.m. to 4:30 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

Museum telephone: 922-9410

Volume 44 Number 7
July/August 1973

# Field Museum of Natural History Bulletin

**Field Museum of Natural History Bulletin**

Volume 44, Number 7
July/August 1973

Cover Primitive woodcut of a spider by the 16th-century German-Swiss naturalist Konrad Von Gesner. Cover design by Clifford Abrams.

**2 Spiders—The Ingenious Predators**
John Kethley
the curious ways of some of man's closest neighbors

**5 Welcome to the Stone Age**
the Museum's Hall of the Stone Age of the Old World revisited

**12 Our Botanists Scour Latin America**
a review of recent field work

**15 Capital Campaign**
$10 million-level reached

**16 Field Briefs**

**Calendar**

Field Museum of Natural History
Director, E. Leland Webber

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# Spiders

## the ingenious predators

By John B. Kethley

*Assistant Curator of Insects*

The fisher spider *(Dolomedes)*, shown about twice natural size, eats small fish as well as tadpoles and insects. About a dozen species are found in the United States and Canada. Photo courtesy of John H. Gerard.

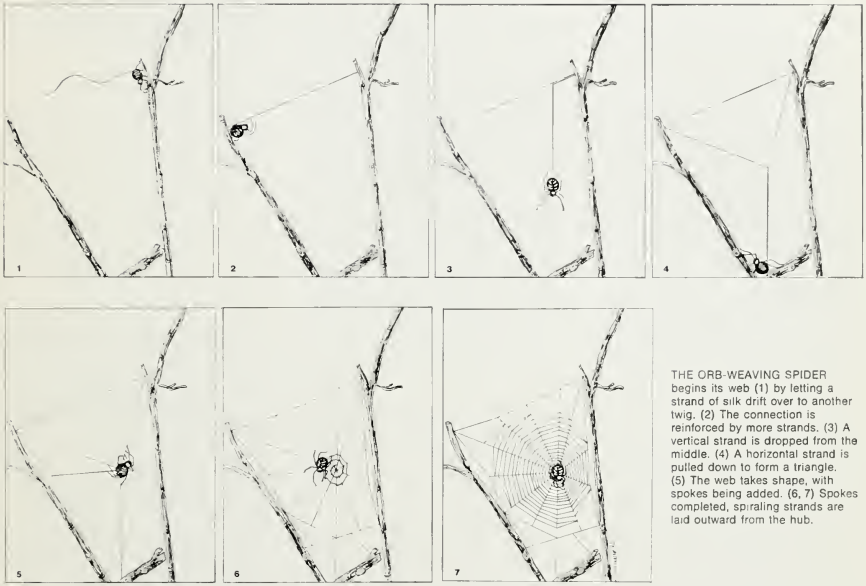
Although they are among the most bashful of creatures, spiders occupy an important place in man's ecological sphere. Compared to their close relatives the insects, spiders are relatively inactive and retiring; most are well camouflaged in dark or dull colors, thus they are seldom conspicuous in nature. It has been estimated, however, that in some grasslands the spider population may exceed 2.2 million per acre. Since all spiders are predators, such an abundance of them has a significant effect on other animals (and plants) in their communities.

As predators, many of the 30,000-odd known species of spiders depend in one way or another on their silk for capturing prey (all possess silk glands). Relatively few spin webs. The beautifully intricate, wheel-shaped webs of the orb-weaving spiders are familiar to everyone. Unlike many of its relatives, the orb-weaver has poor vision. It locates insects or other creatures that have become entrapped in the sticky web by means of vibrations imparted to the web by the struggling victim. The so-called ray-spider also spins an orb-shaped web. This spider lashes several "spokes" together with a central thread, then perches above the web on a twig, holding the central thread and pulling the web into a funnel-like shape. When an insect touches the web, the spider releases the thread and the web snaps free, ensnaring the victim.

**Purseweb and pirate spiders**

For many years spider experts could not determine how the purseweb spider captures her prey. This spider constructs a tubular web with the base sunken into the earth, about three inches of tube extending above ground. The mystery lay in the fact that the upper end of the tube was sealed and the spider was always found inside. Eventually it was observed that when an insect comes in contact with the tube, the spider strikes through the silken tube from the inside. The prey is then pulled through the wall of the tube. Before the spider eats her victim, however, she repairs the damage to the purseweb.

Pirate spiders of the family Mimetidae feed exclusively on other spiders. They




THE ORB-WEAVING SPIDER begins its web (1) by letting a strand of silk drift over to another twig. (2) The connection is reinforced by more strands. (3) A vertical strand is dropped from the middle. (4) A horizontal strand is pulled down to form a triangle. (5) The web takes shape, with spokes being added. (6, 7) Spokes completed, spiraling strands are laid outward from the hub.

do not make their own webs but invade the webs of orb-weavers and comb-footed spiders, killing the rightful owner.

Some pirate spiders of the genus *Ero* quietly enter the web of an intended victim, clear a space among the threads and then pull on the prey's web in the same manner as a courting male. The aroused occupant scurries out, hoping to encounter a new mate, only to become a meal for *Ero!*

**Versatility of silk**

In addition to making webs, spiders use silk in a variety of other ways. Once a victim is ensnared in a web, the spider may completely wrap it with silk and save it to be eaten later. Males make silken packets in which they transfer sperm to the female.

Eggs are often protected by special sacs constructed of silk. Some young spiders use a strand of silk as a "sail." They crawl to the top of a leaf or twig, spin a trail of silk, then are blown aloft. When the wind catches the thread, the spider may be carried for hundreds of miles on wind currents. This is one of nature's unique ways of species dispersal.

Jumping spiders of the family Salticidae do not make webs but search for prey on the ground or in vegetation. When a jumping spider is above ground and spies an insect below, she first secures a drag line to the twig and then jumps. If she misses her prey, the drag line stops her fall, and she scampers back up the line to try another time. Stories of such persistence, patience, and industry among spiders are legion. Scottish hero Robert "the Bruce" (1274-1329) allegedly was inspired to renew his struggles against the English by watching a persevering spider.

Spitting spiders of the family Scytodicae capture their prey in a more sedate manner. When a potential victim is about half an inch away, the spider shoots a blob of sticky silk onto the prey, pinning it to the surface. She then leisurely strolls over to her meal.

Some of the cribellate spiders actually carry their webs to the victim (usually a moth). The spider constructs a small rectangular web and attaches the corners to her four front legs. When an insect lands nearby, the spider leaps on the victim and covers it with the net.

The notorious black widow has a painful bite, but victims usually recover within several hours. Actual body size is about ½ inch. Photo courtesy of John H. Gerard.

The bite of the brown recluse spider ulcerates and is slow to heal. Actual body size is about ½ inch.

**Cannibalism**

Nearly all of the social or gregarious spider species are cribellates. Male cribellates have a less precarious marriage than males of most other groups. During mating, the female allows him to remain in the same web, and will tolerate his presence there for several months afterward.

The killing and eating of the male by the female spider after mating is one of the common misconceptions about spiders. Actually, the fate of the male depends upon a great many highly variable conditions. If the female has recently eaten, or if the male gives the proper identifying cues, he stands a very good chance of escaping after mating.

**Giants and midgets**

One of the largest spiders found in the United States is a species of tarantula, or hairy mygalomorph, *Dugesiella hentzi*, common to the southwest. It easily covers the palm of the hand with its outstretched legs. The tarantula also holds the record for longevity among spiders. Some captive females have lived almost 30 years. Most true spiders, however, live only 12 to 18 months, producing one or two batches of young. Dwarf spiders (Linyphiidae) are the midgets of the spider world. Several would fit comfortably inside this letter o.

**Venomous spiders**

Although most spiders are quite harmless, the entire group is often eyed with suspicion because of a few notoriously poisonous species. In the United States there are two groups of species that one should learn to recognize and regard with caution: the widows, or hourglass spiders (*Latrodectus,* especially *L. mactans*), and the brown spiders (*Loxosceles*, especially *L. reclusa* and *L. laeta*). *Latrodectus mactans* occurs virtually throughout the United States, with the exception of Hawaii and Alaska. Relatively uncommon in nature, it is most frequently discovered in trash piles, under boards, and in outbuildings. The body and legs of the adult female are shiny black and there is a characteristic red hourglass on the lower abdomen; the total leg span is about 1½ inches. The male—a fraction the size of the female—does not bite. The female is actually not very aggressive and must be provoked before she will bite. She is most apt to bite when guarding an egg sac. The venom of the black widow is a nerve poison, causing severe pain, nausea, and muscular weakness, but recovery generally follows in a matter of hours.

The brown recluse (*L. reclusa*) occurs primarily in the Midwest, and like the black widow is quite comfortable in man's dwellings. The characteristic "fiddle" marking is found on the upper part of the body that bears the legs. The venom of the brown recluse causes an ulcerous wound that is slow to heal. The bite of the brown spider (*Loxosceles laeta*) has a similar action to that of *L. reclusa* but is considerably more potent. This spider is native to South America but has become established in the United States.
The large tarantulas of the southwest are greatly feared, but this fear is totally without foundation. A tarantula will not bite unless it is abused. Even then, the fangs usually do not penetrate the skin. If penetration does occur it is hardly more painful than a pin prick; other than this slight discomfort the effect of the venom is nil.

**Spiders are victims, too**

Just as most spiders are aggressive predators, they too, are preyed upon by other creatures. Certain species of mud-daubers and digger wasps seek out spiders, stinging them with a paralyzing venom, then dragging the stunned spider off to their nests to provide food for their own growing young. A notable example of such a predator is the tarantula hawk, *Pepsis*, that searches for female tarantulas. Rarely does this giant spider win battle with the intrepid wasp. Many insects are parasites of spider egg sacs. The larvae of mantid flies are known to develop only in the egg sacs of ground spiders. The larvae of small-headed flies of the family Acroceridae are internal parasites of adult spiders. The most common enemies of spiders, however, are birds and other spiders.

Between its alternate roles as predator and victim the spider manages to hold on to its own delicate foothold in the ecological scheme of things. Like man, the spider has so far been "successful."

*This article was published with the permission of National Wildlife magazine.*

# WELCOME TO THE STONE AGE

## The Museum's Stone Age Hall Revisited

Forty years ago, while a "century of progress" was being celebrated in Chicago, Field Museum was celebrating 5,000 centuries of less energetic progress by opening Hall C, which depicts, in eight dramatic groups, human prehistory from an early stage in the Pleistocene period down to the dawn of the historical period. This reconstruction of 500,000 years of man's past was a spectacle never before attempted by any museum in the world. Since that day in July 1933 millions of visitors to the "Hall of the Stone Age of the Old World" have stood in awe before the life-like groups of prehistoric man, and wondered at the nearby cases of artifacts from the periods represented in the dioramas. The exhibit's unusual human interest, tinged with overtones of adventure and romance, has placed it consistently among the Museum's most famous and popular attractions.

Preparations for the presentation had begun many years before its completion, and involved extensive travel and research, and the acquisition of archaeological collections from Europe as well as other parts of the world. The general plan was the result of many hours of intense collaboration between Henry Field, assistant curator of physical anthropology, and Dr. Berthold Laufer, curator of anthropology, with the cooperation of Abbé Henri Breuil, professor at the College de France in Paris and corresponding member of Field Museum. Their guiding purpose was to present the most complete and interesting picture that scientific knowledge then permitted of the lives, cultures, and physical characters of prehistoric members of the human race.

To obtain data for accurate exhibits, it was necessary to visit many prehistoric sites. In June 1927 Field, Breuil, and well-known American sculptor Frederick Blaschke visited prehistoric sites in Europe to conduct studies for the dioramas. They were accompanied by a photographer, Henri Barreyre, and an artist, Pierre Gatier. For each site scale models were built, and motion and still pictures, as well as paintings, were prepared. This expedition and three more were financed by Marshall Field.

From data collected on these field trips, Blaschke was able to make the life-size human figures, under the direction of Sir Arthur Keith, Prof. G. Elliot Smith, and Breuil. The brushes of Museum staff artist Charles A. Corwin lent dramatic interest and realism to the painted backgrounds.

The resulting dioramas reflect a perfect blend of scholarship, imagination, talent, and labor, for the resource material was, at best, fragmentary—literally. Well-preserved skeletal material of Neanderthalers and Cro-Magnons has often been found, but rarely does the material represent an appreciable part of the complete skeleton. In addition, as pointed out by Dr. Glen Cole, associate curator of prehistory in the Museum's anthropology department, in the October 1972 *Bulletin:* ". . . when such unpreserved aspects of Neanderthal man's appearance as clothing, skin color, and hair form, length, and style are concerned, much guesswork is involved. . . ."

The guesswork, of course, is attributable to early man's inability to keep permanent records of his civilization and pass them down through his ancestors. Although in 1690 a pear-shaped tool, associated with the bones of an extinct elephant, was found near Gray's Inn Lake in London and aroused a little interest, the study of prehistory did not really begin until much later. In 1847 Boucher de Perthes published an account of worked flints collected by him from the alluvial deposits of the Somme River in northern France, triggering, perhaps, the first serious attempts by man to delve into his distant past.

Laufer once wrote, about attempts to reconstruct prehistory, "I would gladly sacrifice all medieval local chronicles of European towns and monasteries and throw the lives of the emperors and

1. The first diorama depicts *Homo erectus* in Europe about 500,000 years ago, although early forms of man also lived in Asia and Africa. These men had a language, made stone tools, and used fire.

martyrs for good measure into the bargain in exchange for one contemporaneous motion picture reel taken of the life of the Neanderthalers and Cro-Magnons and a dozen dictaphone records of their speech and songs, not to speak of the gain that would have accrued to our knowledge of history and anthropology if Alexander the Great, on his conquest of Asia, had been accompanied by an army of camera men." But, Laufer continued, probably with a sigh, "The next best thing to the motion pictures of which we unfortunately are deprived is the drama in eight acts represented by the eight groups of prehistoric man and his culture. . . ."

**Act I—500,000 years ago**

Imagine the outrage of people born just a century or two ago had they come across the Museum's diorama of men of the Pleistocene period, for many of their most learned believed that the world was created in 4004 B.C., according to the chronology of Archbishop Ussher (1581-1656), and that man was the result of special creation. It would have been incomprehensible to them that billions of years had passed before any animal that could be definitely recognized as human had evolved upon the earth, and that it happened so long ago.

The figures in the first diorama, depicting a scene in the middle part of the Pleistocene period in northern France some 500,000 years ago, would, in their minds, have been of questionable similarity to humans. *Homo erectus* appears rugged, has powerful jaws, is covered with coarse, thick hair, and looks quite frightening from our point of view. Because of the meagerness of data on this period, Henry Field and his assistants decided to present the scene in the approximated dimness of silvery moonlight. In the foreground, squatting beside a fire in the shelter of a large rock, are two hunters. One is chipping flakes from a crude flint hand ax, preparing for tomorrow's hunt. On the opposite bank of a meandering river, the fire drives three elephants from their watering place. Farther upstream a hippopotamus can be seen on the bank. Near the skyline a magnificent stag watches the flickering light, while a pack of wolves steals through the underbrush.

During this warm interval in the Ice Age, great varieties of animals dominated the earth. Man, small in numbers and physically weak in comparison, was forced to use ingenuity and his powers of reason. He had knowledge of fire, enabling him to keep away marauding animals. He was becoming sophisticated in the manufacture of stone tools and weapons. The tools he produced are called Acheulean. It is interesting to note that these primitive men could

2. *Homo sapiens* was distributed over much of the Old World by around 100,000 years ago. This second diorama depicts a Neanderthal family on Gibraltar approximately 50,000 years ago.

have walked from France to England to hunt during colder times in the Pleistocene period, when the English Channel did not exist.

At the close of this period, the climate was becoming colder, and the mammoth, wooly rhinoceros, and other cold-loving fauna moved into western Europe.

**Act II—50,000 years ago**

Gibralter, the home of the Neanderthal family of the period depicted in the second diorama, during the most recent cold period of the Ice Age, was far enough south to be among the European *Homo sapiens'* milder habitats; but unlike its northern neighbors this family enjoyed meals of shellfish from the Mediterranean.

The family is shown at the entrance to Devil's Tower rock shelter at Gibralter. Silhouetted against the deep blue of the Mediterranean stands a young man with a wooden club, bringing a rabbit he has killed, as other members of the family go about their daily activities. The father crouches beside the fire waiting for mussels to open as the heat penetrates the shells. His five-year-old son, wishing to help, is bringing twigs to replenish the fire. Within the rock cleft, the mother is carrying her baby on her hip.

In addition to finding new uses for fire and inventing a variety of new tools for scraping skins for clothes and removing meat from bones, observed examples of ceremonial interment of the dead seem evidence that the larger-set (by comparison with *Homo erectus*) Neanderthaler revered his dead and believed in a future life. (This diorama recently underwent a revision, to reflect recent scientific opinion. See the October 1972 *Bulletin,* page 6.)

**Act III—35,000 years ago**

About 35,000 years ago, while the climate of western Europe was still extremely cold, a new race, the Cro-Magnons, entered Europe from Asia.

3. Gargas cave in southwestern France is the scene of many cave paintings and friezes, and one of its chambers is reproduced for the third diorama. A second Cro-Magnon is out of the picture to the right.

They seem to have replaced completely the Neanderthal population, whether due to competition, war, inbreeding, or other causes. No Neanderthal remains are found after this time. The differences in physical appearance between them and the Neanderthalers is apparent to visitors standing before the third diorama in the Museum's drama of stone age men. In general, the Cro-Magnons were taller in stature than the Neanderthalers. Their most important differences, however, are found in their cultures, for here is the dawn of art, and a significant advance in toolmaking.

Two modern theories to explain the emergence of this artistic expression differ, though both connect the Cro-Magnon's art to his food supply. The popular theory contends that art was considered necessary to a successful hunt, that man's art was a form of "hunting magic" that would ensure the artist a good hunt through this ceremonial killing on the cave walls. The other theory, held by many practicing anthropologists, is that these drawings were a form of "fertility magic" that was meant to ensure an abundant game supply.

As can be seen in the third diorama, artistic expression took the form of engravings and paintings in the Cro-Magnon's cave. His depictions of animals are natural, accented with scratches made with tools, or applications of some colored pigment. And, like the creators of the Museum's stone age dioramas, the Cro-Magnon often created models to simplify the faithful and accurate reproduction of the animals. These models were in the form of carvings upon bone, ivory, or stone.

The Cro-Magnon man in the diorama is working by fire and lamplight—animal fat was burned in stone lamps. He is resting on his left knee, his left hand held firmly against the wall with fingers outspread. In his right hand he holds a hollow bone tube prepared from the leg bone of a reindeer. Through this tube he is blowing powdered red ocher around the outlines of his fingers, so that when his hand is removed from the wall an imprint remains. This frieze of hands is reproduced from Gargas Cave in southwestern France. On the ground

nearby are a pestle and mortar used for powdering the ocher, and the shoulder blade of a cave bear upon which part of the coloring material has been mixed with grease. Overhead the stalactites glisten in the glow of the fire. From the back of the cave another Cro-Magnon is coming toward the sanctuary, his face illuminated by the sandstone lamp that he carries.

This scene shows the dawn of art. Art appears to have been an instrument for the practice of magic and religion; at that time, according to Field, there was very little difference between them. Also new during this period was the use of personal ornamentation. Necklaces of reindeer teeth, seashells, or fish vertebrae were worn. The Cro-Magnon hunters may have painted their bodies with red ocher, as their dead have been found buried with a coating of this material. It seems possible that this custom was connected with the belief that blood was synonymous with life, and if so that they were buried thus, along with their finest ornaments and most useful tools and weapons, to make an imposing appearance in the new life beyond the grave.

**Act IV—20,000 years ago**

The scene: Roc de Sers, southwestern France, in a valley bounded on each side by cliffs. In the cliff above the right bank there is a cave with a broad platform below. On this platform are a quantity of burned bones, ashes, and calcined pebbles; flint tools and rejects suggest that part of the platform was used as a workshop. At the back of the platform are large blocks arranged in a semicircle.

The time: early in the 20th century.

Enter: Archaeologist Henri Martin and members of his expedition. In order to excavate underneath the semicircle of large blocks, the scientists remove them —and in so doing throw an entirely new light on the art of the Solutrean period of 20,000 years ago.

When the first block was overturned, sculptures of two animals were discovered on the side which had been lying face down. The remaining blocks were disengaged and set back in position on a natural ledge from which they had fallen or been thrown, and the scientists gazed upon a magnificent frieze. Looking from left to right, they observed on the first block a figure representing a masked human in an attitude suggestive of dancing. On the other blocks are seen two small horses and another animal with an elongated muzzle; a musk-ox, his head lowered, in the act of charging a man, who is fleeing in terror; a short-legged horse and traces of an ox destroyed by the sculptor; and a small horse preceded by a fantastic animal with a head like that of a boar or a carnivore, an elliptical eye, and elongated muzzle, pointed ears, and no horns. The animals are represented as walking and the precision of movement reveals an accurate power of observation. A detailed study of the frieze suggests that it was executed by several artists.

This scene is recreated in the fourth diorama in the Hall of the Stone Age of

4. A Solutrean sculptor of 20,000 years ago carves a horse on a block of stone. On the shelf behind him are reproductions of the other stone carvings found by Henri Martin's expedition to Le Roc, France.

5. The most prominent example of Magdalenian art France. The skeleton of a young girl (represented by a

the Old World, through the courtesy of Dr. Martin, who made casts from the five original sculptures to create the scene as it must have appeared 200 centuries ago. The blocks have been placed in the position in which they were arranged by the Solutrean artists. Museum visitors who look closely at these blocks will note that all of the animals, sculptured in high relief, are pregnant. The questions arises: was the original site a sanctuary for the practice of "fertility magic?"

During the period depicted in this diorama, which shows a Solutrean sculpting a horse on a block of stone, the climate grew colder and the horse and wild reindeer were the chief sources of food. The Solutreans developed new tools, including flint spearheads shaped like laurel leaves. Other new forms of tools show that these people were masters of a flint-knapping technique that had not appeared previously. They also made javelin points of bone and a slender, notched dart that would remain in the flesh of an animal.

**Act V—15,000 years ago**

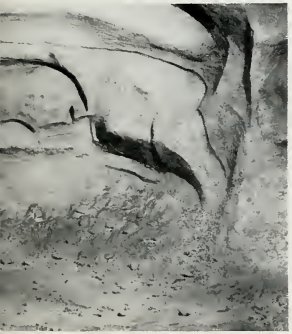
In 1865, a new prehistoric culture, subsequently named Magdalenian, was excavated at the base of an overhanging limestone cliff, where the great rock shelter of La Madeleine, France, is located. Many years later, in a small rock shelter called Cap-Blanc in southwestern France, what may still be the most prominent example of Magdalenian sculpture was found, and it is this shelter that has been reproduced as the fifth diorama in the stone age hall.

During the course of excavation at Cap-Blanc, a workman accidentally drove his pickaxe into a human skull, and a complete skeleton was unearthed. It was determined that it belonged to an 18-year-old girl. The original skeleton, the only Magdalenian skeleton in the United States, is one of Field Museum's unique treasures, and lies in a case near the diorama; a modern skeleton has been placed in the diorama in the same position in which the original was found.

During the Magdalenian period, Europe was still cold and man continued to vie with bears and other animals for possession of caves. But food was abundant, and new weapons assured more successful hunting and fishing. The men of this period produced the finest naturalistic representation of prehistoric times. The frieze reproduced in the Museum's diorama is copied from the Cap-Blanc shelter. Since the drawings were placed far from the entrances of shelters or caves, often upon almost inaccessible walls, the artist was not merely giving expression to his aesthetic emotions, wrote Field, but rather to some quasi-magicoreligious symbolism.

**Act VI—12,000 years ago**

Ice sheets had almost completely melted in much of the Northern Hemisphere. The arctic flora was replaced by the birch and the pine. Modern fauna, characterized by the red deer, took the place of the cold-loving mammoth and reindeer. The mammoth became extinct. And old human culture



0 years ago was found at Cap-Blanc, skeleton in the diorama) was also found.

6. A boar hunt with spears and dogs depicts how the Cro-Magnon of 12,000 years ago had turned from larger herd animals to small game. A fifth dog lies dead, out of the photograph to the right.

began the transition from the old to the new stone age. This transitional period is called the Mesolithic period. Of the several cultures identified with this time in history, the Azilian culture of about 10,000 B.C. was chosen to represent the era in the sixth diorama, and this diorama is the most dramatic of the entire series.

An example of one of the later hunting peoples who roamed the soil of Europe during this period is recreated for Museum visitors with a wild boar hunt at the entrance to the cavern of the Mas d'Azil, near Toulouse. One important step in man's advance toward civilization is immediately apparent: he has tamed dogs to assist in the hunting of his quarry. The scene shows two Azilians at close quarters with an enraged wild boar defending his mate and two young pigs. The hunters have wooden spears armed with flint points. Three of the five dogs shown in the group are restrained with rawhide straps held by one of the hunters. One dog is lying dead near the water, the result of coming within range of the sharp tusks of the male boar, which is being kept at bay.

The assistance of man's faithful companion, the dog, in the hunt might well compensate for the inferior quality of the hunting weapons. But the Azilians were inferior in their art, also, which, when compared to the Magdalenians, is degenerate. They made neither engravings nor sculptures, and their painting was limited to simple designs in red ocher on flat pebbles.

**Act VII—The new stone age**

The moving religious experience of the next diorama provides a sharp contrast to the excitement of the Azilian hunt. Man has moved into the Neolithic period, or new stone age, and brought with him the new culture upon which our modern civilization rests. Among the contributions of Neolithic man is the practice of agriculture; the true domestication of animals, which involves breeding in captivity; pottery-making; the development of settled village life; tool-making by grinding and polishing; and the sophistication of the ideas of law, government, and religion, which were to reach culmination in the succeeding "civilized" societies.

7. Farming was becoming the way of life for people in parts of Europe by about 4000 B.C. This reproduction of a stone alignment in northwestern France suggests they also worshipped the sun.

A form of worship originating during this period is depicted in the seventh diorama. These early farmers placed single standing stones, known as *menhirs*, in parallel lines. These constructions are found in Europe, Africa, and Asia, but the most important is at Carnac in Brittany. Upright stones, from two to twenty-one feet in height, are lined up in parallel rows in three sections. The largest section is eleven lines wide. At the ends of two sections are large rings of stones. At one point the lines cross a collective grave. The line of *menhirs* in the diorama, reproduced from Carnac, running east and west, may have been a place of worship of the sun, possibly connected in some way with the cult of the dead. The priest is shown with his hands outstretched toward the rising sun, which casts long, dark shadows behind the great blocks of weathered granite. He is welcoming the new day, and the emotion of the scene is often translated by its modern viewers as the welcoming of civilization as they know it.

**Act VIII—Dawn of Historical Period**

During the winter of 1853-54 the water in Lake Zurich, Switzerland, receded to an unusually low level, and revealed the first evidence of pile villages—buildings constructed on piles—which had originally been on the lake's shore. The Swiss Lake Dwellers of this late Neolithic period had discovered, as had their relatives throughout Europe, that huts constructed on platforms enabled them to live on already cleared, though wet and boggy, land. Sometimes these platforms were raised or supported on piles.

The ends of the poles—trunks of oak, beech, fir, pine, and birch trees—were pointed with the aid of stone axes and driven into the swampy ground with heavy stones or crude mallets. To make

the platform, trunks of trees were laid across the piles and secured to them by wooden pins. The rectangular huts were thatched with bark, straw, reeds, or rushes. The sides, made of wattles, were covered inside and out with a thick layer of clay.

The Lake Dwellers were an industrious people. They raised cattle, sheep, goats, and pigs, and cultivated crops; they were successful hunters; they practiced weaving of vegetable fibers. They imported, through trade, copper and bronze with which to fashion their implements, elaborate jewelry, bits for their horses, and knives and swords. Their civilization developed quickly, but Henry Field noted that when a people who understood the use of iron came among them, probably as conquerors, the Swiss Lake Dwellers, as representatives of an individual culture, virtually disappeared. Within a few centuries, Rome became the dominant power.

The final diorama in the Hall of the Stone Age of the Old World is a large group showing a calm early morning scene on Lake Neuchatel, about 2800 B.C. In the foreground two fishermen are hauling in their seine, which contains the first catch of the day. The water reflects the pink glow of the dawn, which gives the snow-clad Alpine peaks a roseate hue. On the right is the village with its thatched houses. The villagers are beginning their daily tasks.

The dawn of the historical period is at hand.

**Concluding observations**

"Dioramas," noted the October 1933 edition of *Fortune* magazine, "are a 20th-century improvement in museum technique. Instead of the old-fashioned cases of placarded specimens they offer mounted animals or plaster figures surrounded by carefully imitated stones and trees, all arranged to melt imperceptibly into a painted background . . . Field Museum, always progressive, is the first to offer such reconstructions of prehistoric man. The dioramas . . . are life-size, cost $150,000 to make."

Nearly 3.3 million persons visited Field Museum in 1933, and a large portion of them paused in the stone age hall. Viewing their ancient ancestors must have been a personal experience for each of them.

Henry Field wrote, in *Anthropology Leaflet 31*, that the Hall of Stone Age Man of the Old World allows us "to turn our thoughts longingly back to eons of time that were still a sealed book to the preceding generation. . . . No one who will spend only a few minutes in front of each of these groups will ever forget them; they live and endure in our memory, and their memory will always urge us with irresistible force to return to them. A new world has been opened here to all of us with plenty of food for thought and study."

8. During the third millenium B.C. Swiss villages were built on the soft, wet shores of lakes. This final diorama depicts a late Neolithic period just before the dawn of history.

# Our Botanists Scour Central America

Dr. Louis Williams studies the growth above a tranquil forest pool.

Since the Museum's first botanical expedition—a collecting trip to the Yucatan in 1894-96 by the first botany curator and founder of the herbarium, Dr. Charles F. Millspaugh—more than 60 such expeditions have been made to the American tropics.

During the early months of 1973 several botanical trips were made to this region. Dr. Louis Williams, chairman of the department, was in Guatemala; Dr. William Burger, associate curator, and Dr. Johnnie L. Gentry, Jr., assistant curator, were in Costa Rica, as were Robert Stolze, custodian of the fern collection, and Dr. John J. Engel, Donald Richards assistant curator of bryology (the study of mosses and liverworts). While these men were investigating the flora of Central America Dr. Rolf Singer, visiting research curator in mycology (the study of fungi), was in Ecuador.

Prof. Antonio Molina R., curator of the herbarium at the Escuela Agricola Panamericana in Honduras and Roy Lent in Costa Rica assist Museum staff on field trips and independently collect materials in these regions where they are permanent residents.

**In Guatemala**

The purpose of Dr. Williams' trip—which lasted from November 1972 to January of this year—was to increase the representation in our collections of those groups of plants still to be written up for *Flora of Guatemala*, a project that will engage him for at least another three years. In preparing the work he will be assisted by Mrs. Dorothy Gibson, supervisor of the John G. Searle Herbarium and associate in the *Flora of Guatemala* project. This work will complete the *Flora of Guatemala*, totaling more than 7,000 pages. (A "flora" in this sense is an encyclopedic inventory of plants.)

While on his Guatemala trip, Williams was also particularly interested in collecting members of the enormous Compositae (the family consisting of daisies, asters, and their kin), whose members usually flower in greatest abundance toward the end of the rainy season. A very large assemblage of these plants was made and they are now being processed at the Museum. Dr. Williams was assisted in the field by Mrs. Williams and by Prof. Molina. Most of their work was done in the western highlands of Guatemala. They also did some collecting in the central high region, in cloud forests, and along the humid Atlantic coastal plain.

**In Costa Rica**

Former curator of the herbarium Dr. Paul C. Standley was the first Field Museum botanist to work in Costa Rica, spending several months there from 1924 to 1926. On the basis of the botanical materials he collected in the country and his experiences there, Standley prepared a *Flora of Costa Rica*. Since 1945 Dr. Williams and Prof. Molina have made a dozen or more collecting trips to the country. More recently, Dr. Burger has taken up the Museum's botanical research interest in Costa Rica and has just completed his third field trip there, accompanied by Dr. Gentry for whom this was an introduction to tropical regions. Specialists in taxonomy (classification), Burger and Gentry visited Costa Rica in March and April, primarily to obtain additional botanical materials for the preparation of a flora of the plants of that country. Although usually of just a few weeks' duration, the several trips to the region have together covered almost the entire year, thus enabling the Museum botanists to collect plants that flower during each of the seasonal periods.

Smaller than West Virginia, Costa Rica has exceedingly rich and varied flora; the country has more kinds of ferns than all of temperate North America and five or six times as many orchids. (Interestingly enough, the lush vegetation of tropical regions ordinarily is not characterized by the kind of mass floral displays that are common to Illinois woodlands in the spring or to prairie meadows in the summer.)

A plant specimen is trimmed and placed in a newspaper prior to drying and shipment. After being labeled, identified, and mounted, it will become part of the John G. Searle Herbarium, which contains more than 2,500,000 specimens.

In addition to making general collections, Burger concentrated on members of the mulberry family (Moraceae) and the nettle family (Urticaceae). Gentry collected material of the potato family (Solanaceae) and borage family (Boraginaceae) and took samples of immature flowering buds, of seeds, and of root tips. These were placed in a special fixative, or preservative, which allows the integrity of the chromosomes to be retained indefinitely. Later, in the Field Museum laboratory, tissues of these samples are to be studied microscopically and chromosome counts taken. (These counts are often invaluable in classification. Two similar plants can frequently be recognized as discreet species by differences in the chromosome counts of their respective cells.)

The March-April trip was particularly successful, reports Dr. Burger, because he and his colleagues were able to collect from a wide variety of habitats, including a leafless deciduous forest (during the height of the dry season) and several lowland rain forests. They also worked in the central highland forests up to elevations of 11,000 feet. This season the work was hampered by unusually severe conditions. Low water levels in the reservoirs resulted in an acute electricity shortage. In the city of San José, where they were headquartered, all electricity was cut off from 7 a.m. to 7 p.m. for several weeks.

Dr. Gentry examines a giant leaf of an aroid. Such leaves are sometimes used as umbrellas.

The most serious effect of this shortage, as far as Museum workers were concerned, was the difficulty it created in the drying of collected specimens at the expedition's laboratory in the National Museum of Costa Rica.

Mr. Stolze and Dr. Engel had looked forward to a collecting trip in March and April to Cocos Island, a volcanic island some 400 miles southwest of Costa Rica. The uninhabited island is remarkably rich in ferns, mosses, and liverworts, and little scientific collecting of any sort has ever been done there. Stolze's and Engel's plans had to be aborted, however, when the fishing boat that was to take them to the island was severely damaged in port. Fortunately, they were able to shift their collecting activities to the Costa Rican mainland. They succeeded in bringing back an outstanding collection as the result of a month's work. Among their findings were a number of extremely rare and possibly new fern species and several liverwort species never before collected in Central America.

The Field Museum's Central American floristic studies are funded for the most part by National Science Foundation grants. All expenses of these field trips are borne by the grants. The grants also support the ongoing field activities of Roy Lent and Prof. Antonio Molina.

## ALL IN A DAY'S WORK

*Collecting in the field is no vocation for tenderfoots or for starry-eyed seekers of adventure, as attested by this recent letter from Roy Lent, a Costa Rica resident who does field work for the Museum.*

*Well I made it to Burica* [Costa Rica], *and what's more important, I got back!! By telephone I made arrangements through a series of middlemen for an "expert" launch man to take us out to Burica. When we arrived in Golfito he started frantically hunting for someone who knew the area as before he had been lying about his experience. He finally found the police agent of Burica who, naturally, knew the area. We left in a 9 yard long dugout with an outboard, at 2:00 a.m. After five hours in the open Pacific much of the time, we began to see the Burica Peninsula. At that time it was announced that there was not enough gas to get to the end of the peninsula so we would have to be landed halfway down. We headed for the shore and then began to realize how big the breakers were! The police agent took the motor and yelled, "Hold on, we're going in!" while the owner was yelling "NO, NO, we can't make it!" Just before we hit the beach a wave overtook us, killing the motor and swamping the launch. We all jumped overboard and managed to get the thing to the beach. Although everything was packed in plastic bags, many things were wet, including all the newspapers* [for packing plant specimens]. *While the two men got the launch back in condition to return we set up camp near a thatched farm "house." By moving the launch down the beach to a better area and waiting for a change of the tide the men got the launch back out to sea and left . . . I later found out that while we were in Burica, the owner of the launch announced that he was not going back to get us in spite of his verbal contract nor would he allow his boat to be used because the area was too dangerous. The police agent and another involved had him taken to the local police station and there he was told to allow someone to take his boat for us or he would be jailed for breach of contract!*

## $10-Million mark reached!

The Museum's three-year capital campaign, begun in September 1971, for renovation of its building has reached the $10-million mark with a $50,000 gift from the Allstate Foundation.

"This gift and all others received are extremely gratifying to those persons serving on the various campaign committees as well as the entire Museum staff," said Museum Director E. Leland Webber. "With Allstate's gift we have achieved 80 percent of our goal."

Gifts from foundations, corporations, and individuals will provide half of the $25 million the Museum is seeking for renovation of its 52-year-old building. Bonding authority of the Chicago Park District is providing the other $12.5 million on a matching basis.

The Museum has recorded many corporate gifts, such as Allstate's, this spring. According to Nicholas Galitzine, Museum trustee and general chairman of the campaign, "Sizable gifts last fall, climaxed by a million-dollar Kresge Foundation grant in February, seem to have given renewed emphasis to our capital needs."

Among other gifts pledged during the past three months are $30,000 from Western Electric; $25,000 each from General Motors Corp. and United Air Lines; $20,000 from Ernst & Ernst; $15,000 each from Arthur Andersen & Co., Harry Weese & Associates, General Mills, J. C. Penney Co., and Union Oil Co. of California; and $10,000 each from Burlington Northern Foundation, Chicago Bridge and Iron Foundation, Kirkland & Ellis, U.S. Steel, and Xerox Corp.

## Individuals Division expanded

An intensified effort to reach many more key members of the Chicagoland community was begun with the expansion recently of the capital campaign's Individuals Division, co-chaired by Marshall Field and William H. Mitchell. According to Messrs. Field and Mitchell, $226,000 in individual gifts, including a $106,000 anonymous contribution, was pledged during the first five months of this year. Field, publisher of the Chicago Daily News and Chicago Sun-Times, and Mitchell, honorary chairman of Mitchell Hutchins & Co., and members of the committee will invite community leaders to luncheons at the Museum, where they will view a slide program outlining the Museum's purposes, activities, and needs, followed by a tour of the Museum's facilities.

Committee members of the Individuals Division include Bowen Blair, partner, William Blair & Co.; Edward F. Blettner, honorary director, First National Bank of Chicago; R.E. Brooker, chairman of executive committee, Marcor, Inc.; Cameron Brown, chairman and president, Interstate National Corp.; James R. Coulter, vice-president of transportation, Continental Illinois National Bank and Trust Co. of Chicago; Thomas E. Donnelley II, R.R. Donnelley & Sons; R. Winfield Ellis, Blunt Ellis & Simmons; Donald M. Graham, chairman, Mayer, Brown & Platt; Mrs. Corwith Hamill; Gerald Hollins, Harris Upham & Co., Inc.; Robert L. Raclin, partner, Paine Webber, Jackson & Curtis; Joseph E. Rich, vice president for foreign operations, Morton-Norwich Products, Inc.; John S. Runnells, investor; William L. Searle, chairman, G.D. Searle & Co.; Leonard Spacek, senior partner, Arthur Andersen & Co.; Gardner H. Stern, Sr., chairman of finance, Hillman's, Inc.; John W. Sullivan, chairman, Skil Corp.; and Morrison Waud of Gardner, Carton, Douglas, Chilgren & Waud.

Blair

Blettner

Brooker

Brown

Coulter

Ellis

Graham

Raclin

Rich

Runnells

Searle

Spacek

Sullivan

## Illinois Arts Council Grant For African Exhibition

The Illinois Arts Council has recently awarded a $4,500 grant for planning and development of the Contemporary African Arts Exhibition, scheduled to open at Field Museum in the spring of 1974. The grant is funded jointly by the National Endowment for the Arts and by the Illinois Arts Council, an agency of the state.

## Herpetologist Joins Staff

Dr. Harold K. Voris, a native of Chicago, has recently been appointed assistant curator of reptiles. Formerly a faculty member of Dickenson College, Carlisle, Pa., he holds an AB degree from Hanover College and a PhD from the University of Chicago. Dr. Voris has done special work on snake venom, on sea snake ecology, and on the population biology of frogs.

## Dr. Robert F. Betz Honored

Dr. Robert F. Betz, research associate of the department of botany, was honored recently by the Illinois Audubon Society. In recognition of his outstanding work in conservation, Dr. Betz was declared Illinois Audubon Man of the Year. A professor of biology at Northeastern Illinois University, in Chicago, Dr. Betz has been affiliated with the Museum since 1971. He also serves as consultant to the Illinois Nature Preserves Commission and is coordinator of the Gensburg-Markham Prairie, a tract of virgin land just outside of Chicago. Dr. Betz was among the first to recognize the unique worth of Markham Prairie and has worked for its conservation for more than a decade.

## Grade Schoolers Select Indian Studies

When sixth graders at the Chippewa School in Bensenville were asked to choose the program they would most like to study at Field Museum, they unanimously selected the cultures of the Woodland and Plains Indians. Two of the youngsters, Beth Cowling and Steve Craig, who are of Indian ancestry, are shown looking at one of the exhibits they saw during their recent visit. Incidentally, Steve is the great-grandson of Sitting Bull, famous American Indian warrior and tribal leader.

Dr. Phillip Lewis (left), curator of primitive art and Melanesian ethnology, is shown with Mrs. Danielle Demetz of France, Richard B. Nunoo of Ghana, and Gregorio B. Folgar of Guatemala as they view a group of Malvina Hoffman sculptures in the President's Room. The visitors were members of a group of foreign museum professionals, here to study museum operations.

## New Building Superintendent Named

Field Museum's new building superintendent is Norman P. Radtke, a Chicago native. In addition to being fully responsible for the operation and maintenance of the Museum's physical plant, Mr. Radtke has important responsibilities coordinating the many construction projects under the museum's $25 million rehabilitation and modernization programs now in progress.

## Foreign Museum Professionals Visit Field Museum

Professional staff personnel of museums in 21 foreign countries made a special visit to Field Museum on June 1. The visit was sponsored by the American Association of Museums in cooperation with the Bureau of Educational and Cultural Affairs of the U.S. Department Of State and was part of a tour that included major U.S. museums. The purpose of the tour was to acquaint the foreign professionals with museum operations in our country. Museums in Europe, Asia, Africa, Australasia, and Central and South America were represented.

## African Osteologist Visits

Recently Mrs. D. Margaret Leakey of the National Museums of Kenya visited Dr. William D. Turnbull, associate curator of the Field Museum's department of geology, for two days to examine the Museum's specimen storage facilities and to advance her osteological (bone) studies. The former daughter-in-law of Mary and the late L.S.B. Leakey of Olduvai Gorge (fossil man) fame, she holds the position of osteologist at the National Museums of Kenya in Nairobi. She has studied under and collaborated with Mary Leakey.

While in Chicago, Mrs. Leakey acquainted herself with some of the ongoing research at Field Museum of Natural History. Here Dr. Turnbull shows her the skull of *Thylacosmilus*, the remarkable, extinct, carnivorous South American saber-toothed marsupial, whose jaw muscles he has just reconstructed and studied.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# CALENDAR

## Exhibits

Closes July 15

**Below Man's Vision: Electronic Windows to Unseen Worlds,** an exhibit exploring the world of details in common objects and familiar plants and animals, and offering glimpses into current research activities. Nearly 300 photographs, displayed at up to 200,000 times life-size, introduce a previously unseen world. Hall 18.

Closes July 29

**Seventeen-Year Cicada: A Strategy for Survival,** a multi-media exhibit describing and interpreting the adaptive significance of the unusual life cycle of these strange insects. Millions of cicadas made their noisy appearance above ground in the Chicago area early in June. Hall 9.

Continuing

**Adaptations of Amphibians and Reptiles,** an exhibit of photographs portraying the natural beauty and aesthetic qualities of these animals, as well as illustrating some of their often remarkable and unique adaptations which help them survive. They were taken by Dr. Nathan W. Cohen, Chairman, Department of Continuing Education in Sciences and Mathematics, University of California, Berkeley. Through September 30. Hall 27.

**Color in Nature,** an exhibit examining the nature and variety of color in the physical and living world and how it functions in plants and animals. Continues indefinitely. Hall 25.

**Field Museum's 75th Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Children's Programs

**Movies at 10:00 a.m. and 1:00 p.m., James Simpson Theatre**

July 5: "In the Bush"
The kit fox and Australian animals.

July 12: "Lapland"
A visit to a fascinating northern land.

July 19: "The Mixed-Up Hound Dog"
The exciting adventures of a hunting dog.

July 26: "The Merry-Go-Round Horse" (A Fantasy)
The love of a boy for a wooden horse.

Continuing

**Summer Journey for Children,** "Nature Invented It First," a self-guided tour highlighting animals and plants which possess "innovative" features duplicated in human inventions. Youngsters are provided wtih a questionnaire which routes them through Museum exhibit areas. All boys and girls who can read and write may join in the activity. Journey sheets available at entrances. Through August 31.

## Meetings

July 11: 7:30 p.m., Windy City Grotto, National Speleological Society.

August 8: 7:30 p.m., Windy City Grotto, National Speleological Society.

## July and August hours

9 a.m. to 6 p.m. Monday, Tuesday and Thursday; Museum cafeteria open 9 a.m. to 2 p.m.
9 a.m. to 9 p.m. Wednesday, Friday, Saturday and Sunday; Museum cafeteria open 9 a.m. to 7:30 p.m.

The Museum Library is open 9 a.m. to 4:30 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

Museum telephone: 922-9410

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## contents

**ART IN AFRICA TODAY** 3
Preview of a forthcoming exhibit
By Maude Wahlman

**THESE BIRDS WERE ONCE ENDANGERED SPECIES** 8
Extinct birds of North America
By David M. Walsten

**WINDIGO** 12
Cannibal myth of North American Indians
By Charles A. Bishop

**ROBERT KENNICOTT** 17
Chicago's first naturalist
By W. J. Beecher

**LETTERS** 19

**FIELD BRIEFS** 20

**CAPITAL CAMPAIGN** 22

**CALENDAR** 23

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## cover

Bead painting by Nigerian artist Jimoh Buriamoh; from the collection of Dr. Robert P. Armstrong, Evanston, Ill.

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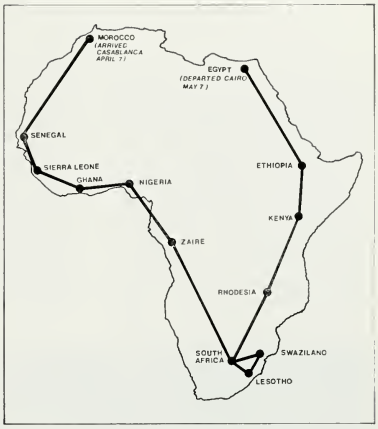
# ART IN AFRICA TODAY

**preview to a forthcoming exhibit**




Itinerary of Maude and James Wahlman's African trip

By Maude Wahlman

A FESTIVAL on contemporary African arts is scheduled to have its opening at Field Museum in the spring of 1974. The festival includes an exhibit of contemporary African arts, educational programs, and an African arts shop. Plans for the festival followed a showing to Museum staff in 1971 of "New Images of Oshogbo," a film produced by Frank Speed about a small town in Nigeria.

The movie shows the continuity between the town's traditional ceremonies and its contemporary artists. When the movie was over, Lothar Witteborg (chairman, department of exhibition) asked if any of the contemporary art shown in the movie had ever been exhibited in the United States. I replied that there had been a few exhibits of Nigerian art, but never a major show of contemporary African art in the United States. Major exhibits have been held in England and Europe, however. As a result of that conversation, I began thinking about the merits of such an exhibit for Field Museum. With encouragement from my colleagues, I submitted a proposal for an exhibit-planning grant from the National Endowment for the Arts; the Museum was awarded the grant in April 1971.

After a lengthy investigation, a number of ideas for an African arts exhibit were discussed with staff members of other departments at Field

A gaily decorated compound of a Ndebele village near Pretoria, South Africa

*Maude (Mrs. James P.) Wahlman is consultant in African ethnology at Field Museum.*

Museum. We decided on a traveling exhibit. It became apparent that some aspects of contemporary African culture could best be conveyed through films, lectures, and performances. Thus, we started thinking in terms of a festival for the six months the exhibit would be in Chicago, with series of demonstrations, lectures, films, and performances. It was also apparent that the various materials of contemporary African arts could be adapted to the Museum's Harris Extension kits which are sent out to Chicago schools. These small exhibit kits are being planned as a means of introducing children to the subject of African arts before they see the large exhibit at the Museum.

After one has become involved in planning educational materials in conjunction with an exhibit, the possibilities seem limitless. One idea was a catalog-textbook on contemporary African arts. Such a text does not yet exist; in fact, the last major book on the subject was published in 1960. Another idea was a set of slides or a filmstrip that could be sold with the catalog as illustrative material for teaching a course on contemporary African arts. Other ideas are an African arts workshop and an African dance workshop. Funds for making realities of these ideas are still needed. Only the exhibit itself is now fully funded.

Rhodesian sculptor Thomas Mucarobgwa

**Community participation**

One goal which was formulated during the planning process for this festival was to involve individuals from the Chicago community in the planning and promotional activities. We now have work volunteers; other persons have volunteered to lend art works for the exhibit. An advisory committee is expected to be formed in the near future. This group will be made up of persons interested in Africa, in art, and in the impact this exhibit can have on the Chicago community.

**Volunteers**

Research for the program involved an extensive task of locating numerous references to contemporary African arts in obscure publications. The investigation of these references would have been an endless project had it not been for the help of many volunteers. Much of the program's progress is due to their faithful concern. In the summer of 1972 there was one volunteer for the program. Now there are 20. Some volunteers are students, some are housewives; others are employed persons with wide interests. Each one selected an academic or artistic discipline and proceeded to make basic investigations—developing a bibliography, locating articles in the Museum library and other libraries, and copying the most important articles for a master file on the subject. Our forthcoming catalog is now in the preliminary stage of card files and

Nigerian woodcarver Michael Odekunle is an apprentice to Lamidi Fakeye, Nigeria's foremost sculptor who demonstrated techniques at Field Museum in 1972.

folders that grow fatter every week. These repositories will also provide material for labels to be used on exhibited materials and for the educational components.

**African arts shop**

One reason that I personally looked forward to being involved in such an exhibit was that during my years as a graduate fellow at Field Museum, I had been exposed to many dealers bringing African "art" to Chicago for sale. Some dealers had good art, but one always wondered if their artifacts might not have been stolen from an ancestral shrine. Other dealers were just deceiving the public with fake antiquities—artifacts made within the past six months, then covered with kola butter and buried in the ground for several months so that ants and termites would eat away the butter and rapidly age the "art." Dealers were getting high prices for these pieces, mostly because African antiques are very rare, and because most people cannot distinguish between the real and the imitation. Africans have access to the same African art books as we do, and those few dishonest dealers can very cleverly fake almost anything. It takes years of seeing hundreds of objects to be able to recognize a fake, and even the experts are fooled now and then. "Don't buy African art as an investment—it's too risky," they advise. "Buy only what you like and want to live with." There is also a problem of ethics in buying antiquities. Many African countries have laws that prohibit export of their most valued cultural artifacts. And many museums have established policies like that adopted by Field Museum in July 1972, which states that it will not authenticate, accept as gifts, or purchase any artifacts that are not accompanied by legal export papers.

But it is hard to advise people not to buy antiquities when there is so little else available in this country. Airport art—that is, African art made in factories for tourists only—is no better than fake art. I was aware that good art existed in Africa—I had seen it everywhere in 1970 while doing field work for a dissertation. I had gone to Africa to collect contemporary pottery for Field Museum and wound up collecting pots and much more: baskets, textiles, jewelry, and leatherwork. It was with this experience in mind that I felt we should try to make many arts available to the public. Thus, we have planned an African arts shop, which will make available a greater variety of items for public purchase than we will try to cover in the exhibit.

**Role of the artist in African society**

One myth that we hope to correct in this festival is that the African artist is anonymous; he never has been anonymous nor is he today. Traditionally, the artist was known to his own society. He did not need to sign his works, because societies were small enough so that everyone knew his work. One cannot generalize for all of Africa, for the artist in different cultures plays different roles—sometimes he is a person of status, sometimes not—but in any case he is known.

Traditionally, most art was made for religious cults—as ancestor figures, representations of deities, worshippers of deities, or as receptacles for ritual objects. Other works of art fulfilled secular functions. But whether religious or secular, all art was intended to be useful, either to decorate everyday utensils or wearing apparel, or to be employed for special occasions. Art was and is an important aspect of daily life—for the common man as well

"Mama Kadi," famed textile designer of Sierra Leone, does batik (above) as well as tie-dyeing.

as the king. For these reasons the festival is designed without the traditional western dichotomy of "art" versus "crafts"—a distinction that is not to be found in African vocabularies.

Today the picture is modifying. The local religious cults are no longer followed as much as in the past, as Christianity and Islam have had their influences. No one can say this is wrong, for every culture evolves, and every culture has outside influences at some time or another. But some artists find themselves in a difficult position during the period of transition. They must find new patrons. Many find their patrons among a new educated class of Africans. Some appeal only to tourists. Some teach for a living and do their art in their spare time. Art is also commissioned by African governments and by international religious groups. Art is still very much a part of daily cultural life.

For this exhibit it seemed that the different personalities and different roles the artist plays in changing societies might best be shown by examining the worlds of individual artists—revealing how the artist creates his art, and what he does when he is not being an artist. The exhibit should tell something about the artist's family, his friends, and how he believes art should function today. For each of the African artistic disciplines I tried to locate one outstanding artist as a representative. This was often difficult, because there is very little up-to-date information on contemporary African artists.

**The trip to Africa**

Actual interviews with artists—getting their views on tape about contemporary Africa—seemed a most logical means of documenting this information. It also seemed that the best way to purchase contemporary arts for a shop to go with the exhibit was to go to Africa and buy them there.

In the spring of 1973 Field Museum received a planning grant from the Illinois Arts Council, and another grant from the National Endowment for the Arts—this time for the exhibit itself. On April 6 my husband James and I left for Africa to photograph, record, and collect contemporary African art. We landed in Casablanca (Morocco), and flew from there to Dakar (Senegal); Freetown (Sierra Leone); Accra (Ghana); Lagos, Ibadan, Ife, Oshogbo and Oyo (Nigeria); Johannesberg, Pretoria, Zululand, Xhosaland (South Africa); Meseru (Lesotho); Mbabane (Swaziland); Salisbury (Rhodesia); Nairobe (Konya); Addis Ababa (Ethiopia); and Cairo (Egypt). My reaction to what I observed is that a real renaissance is now occurring in African art. A much greater diversity was apparent than what I had seen in 1970, and I found an even greater vitality. I would like to share with you some of the highlights of that trip:

A young Ndebele girl of South Africa, Mary Msiza, fashions a belt of colorful glass beads. Around her neck she wears one of her own creations.

**Sculpture**

Sculpture is a very old art form in Africa, whether it be in wood, stone, or clay. Lamidi Fakeye, the foremost Nigerian sculptor, gave a woodcarving demonstration of his techniques on October 1972 at Field Museum. While I was in Nigeria I discovered that many of his apprentices have now set up their own shops and are also producing very fine work.

Across the continent, in Salisbury, Rhodesia, we photographed the stone sculptor, Thomas Mukarobgwa, while he was working on a large stone sculpture. Examples of his monumental work are to be found in private collections in the United States; for the exhibit we hope to borrow some of these pieces.

**Textiles**

I went to Sierra Leone to photograph the dyer, Mrs. Kadiato Kamara, better known as Mama Kadi, famous for her tie-dyed and batiked textiles. Among her outstanding tie-dyed patterns is the cloud pattern. It is the most difficult design to create as it is done by gently folding satin into very delicate but distinct folds which compress into each other until the entire cloth is folded into a small package. This must be bound with twine without losing its composition. The bundle is soaked in indigo (blue) dye for about 20 minutes and put on a line to dry. It may later be refolded and redyed either in indigo again or perhaps in a kola nut dye which produces a rich brown. Synthetic dyes are also used. Once the excess dye is washed out, the colors are fast.

For batik dyeing, Mama Kadi uses wooden stamps, made by local craftsmen, which she dips in a pot of hot wax and stamps onto a damask cotton. The cotton is then dyed with indigo, dried, redyed, and dried. After that it is dipped several times in boiling water to remove the wax. Finally it is rinsed in cold water and again dried.

**Aluminum panels**

Asiru Olatunde is a well known Nigerian artist who creates aluminum panels depicting scenes of Yoruba life and history. His is a unique art, for although scenes of Yoruba life have been and still are depicted in wood (usually for palace doors) there has been no traditional use of aluminum for art. Olatunde uses a counter-repousse technique—all the work is done from the front of the panel.

**Beadwork**

Beadwork is another of the traditional arts that is still being practiced in Africa. The art was perfected in earlier times by the Zulu, Ndebele, and Xhosa peoples of South Africa. In the Museum's permanent collections are many old examples which will be shown in the exhibit along with the new.

Beadwork was also a high art among the Yoruba of Nigeria. Traditionally it was commissioned in the form of ceremonial objects for use by priests. Today, a very talented young man, Jimoh Buriamoh, has transformed the art into a new form, that of bead paintings. One of his creations is shown on the cover of this *Bulletin*. He glues beads onto a wooden base, but in such a way that at a distance it is difficult to distinguish the beaded areas from the painted areas. His compositions depict contemporary Nigerian life as well as mythological figures.

This is just a sample of the continent as we saw it: people of various African cultures being creative in their individual ways. The exhibit will try to communicate the same feeling. The festival will also attempt to show (1) all the arts: music, dance, film, literature, and the visual arts (painting, sculpture, graphics, pottery, calabash carving, leatherwork, basketwork, and metalwork); (2) arts from all over Africa; (3) the relationships between the contemporary and the traditional arts; (4) the interrelationships of the arts to each other; and (5) an African aesthetic as distinct from the Euro-American or Far Eastern aesthetic.

Funding is not yet complete for all aspects of the festival, but we continue to plan, knowing that when the money comes, we will be ready.

Nigerian metalworker Asiru Olatunde (below) recreates contemporary and historical scenes on thin aluminum panels. Paneled church doors at the University of Ibadan (above) are an example of his unique art form.

# *These Birds were once Endangered Species*

## now there are none

By David M. Walsten

IN LESS THAN 100 years, four species of continental North American birds—the passenger pigeon, the Carolina parakeet, the heath hen, and the Labrador duck—have vanished forever. A fifth species, the Eskimo curlew, may very likely be extinct, since few have been sighted in recent decades and none at all for several years. The great auk, which vanished from North America in the late 1700s, disappeared from the last of its North Atlantic habitats in the mid-19th century. Man, the interloper, played a significant role in the depletion of each of these species.

THE GREAT AUK (*Alca impennis*), once common in the North Atlantic, was exterminated largely because it was unfortunate to have flavorful meat, fat that yielded oil useful as fuel in lamps, and soft feathers that made good mattress and pillow stuffing. The flightless bird was slow and ungainly on land and was easily run down by hunters and beaten to death. A few men armed with clubs could, in a short time, wipe out an island's entire auk population.

On June 3, 1844, the last two specimens were taken on Eldey Rock, off the coast of Iceland. Their bodies were sold to a collector. Nineteen years later several dozen great auks were discovered in frozen peat beds of Penguin Island, off the southern coast of Newfoundland. Many of these carcasses, too, were sold to collectors at fancy prices.

The great auk stood about two feet tall; like the penguin, it had tiny wings that functioned only as flippers. Though awkward afoot, the birds were marvelous swimmers and migrated great distances in the stormy northern seas. Ornithologists believe that the auk disappeared from the coastal islands of North America in the late 1700s.

Skeletal remains in various places along the New England coast indicate that they once lived as far south as Massachusetts. A few bones have been found on the Florida coast. It is thought that these were not from resident auks, but from lost birds driven southward by storms. The species also ranged eastward over the Atlantic as far as the northernmost coast of Norway.

In 1966, the Field Museum acquired a great auk from the Royal Institute in Brussels, Belgium. The bird arrived in a box marked *penguin*, (the French

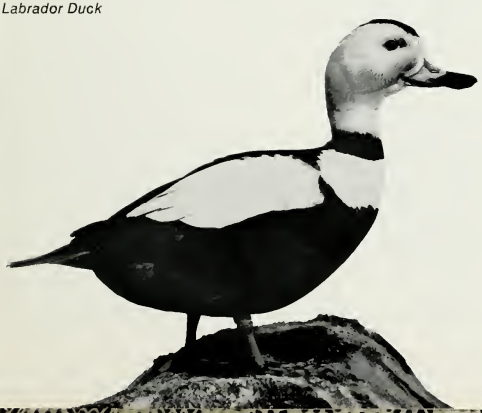
— *Great Auk*

word for "great auk"), which caused some consternation until the bird was examined and its true identity established. (For a full account of the acquisition of this specimen, see the *Bulletin,* February, 1967.)

THE LABRADOR DUCK (*Camptorhynchus labradorius*), which lived mainly in coastal areas from New Jersey northward to Labrador, has been extinct for nearly a century, the last recorded specimen having been shot on Long Island, New York, in 1875. None other had been seen since 1871.

The male Labrador duck was a handsome bird, with a white head and a black stripe running back across the top. A velvety black collar encircled the white neck. The rest of the body was mostly black and white. The female was brownish. The species was apparently never common, and it was not very good eating; occasionally, however, the duck was to be found in food markets in New York and other eastern cities. The preferred habitat was sandy coastal areas, inlets, and bays; the bird was extremely wary and difficult to approach. The reasons for the Labrador duck's eventual demise are not understood, but some authorities believe that unusual feeding habits may have been a factor—a theory suggested by unique features of its bill structure.

*Labrador Duck*



*Carolina Parakeet*

THE LAST CAPTIVE Carolina parakeet —like the last passenger pigeon—died in the Cincinnati Zoological Gardens in September 1914. The last specimen taken in the wild was captured in Brevard County, Florida, in 1901, but authentic sightings of this species occurred in that state as late as 1904. Eight years later, reliable sightings of the bird were also reported in Missouri. There were two subspecies, *Conuropsis carolinensis carolinensis* (the eastern subspecies) and *Conuropsis carolinensis ludoviciana* (the western subspecies, sometimes called the Louisiana parakeet). Both were about a foot long —much of this in tail feathers. The head was orange and yellow, the body green and yellow. The wing feathers were also trimmed in yellow. The tail was green. The western subspecies was somewhat paler than the eastern, and parts of the back had a bluish cast.

Before the coming of the white man, the Carolina parakeet commonly occurred in deciduous forests from Virginia to Florida, westward to Texas and northward to Nebraska. Sometimes it strayed as far north as the Great Lakes region. The theory has been advanced that the bird's disappearance was the direct result of human activity —too many were captured or shot; but since the bird commonly lived in relatively inaccessible swamp forests, it would be unfair to say that man was entirely responsible.

AN OBITUARY that appeared in newspapers around the world on Sept. 1, 1914, caused many readers to pause and reflect, for it not only reported the quiet, uneventful death of "Martha," a 29-year-old passenger pigeon in the Cincinnati Zoological Gardens, it also marked the extinction of what possibly had once been the most populous of all bird species on the face of the earth. Less than a century earlier (1810) ornithologist Alexander Wilson had observed near Shelbyville, Kentucky, a flock that numbered—by his estimate—nearly 2.25 billion birds. "Martha," born in the zoo in 1885, was the final known survivor.

The passenger pigeon (*Ectopistes migratorius*) was an uncommonly beautiful bird, 12 to 18 inches long. The wing and back feathers of the male were a rich glossy blue. The breast was burgundy, fading to white near the tail. The neck was mottled with green and bronze; the eyes were fiery orange, the feet red. The main habitat was the hardwood forests of central North America. A migratory bird, it journeyed in the autumn to southeastern United States and the Gulf Coast area.

The flesh of this bird was very good to eat and it had been hunted by Indians long before the Europeans arrived. But the white man made a commercial enterprise of pigeon hunts and the birds were shipped in great quantities to markets in the cities.

It is incredible that hunters—numbered in the thousands—could, in the space of a century or so, deplete a bird population that had totalled in the billions. Yet, this is precisely what happened. The last great pigeon hunt occurred in 1878 near Petoskey, Michigan. In a month's time about 300 tons of birds were slaughtered—filling 150 freight cars. After that their numbers rapidly dwindled to the extent that commercial hunting was no longer profitable. The last passenger pigeon captured in the wild was taken at Babcock, Wisconsin, in 1899. An idiosyncrasy of this species, apparently, was its inability to perpetuate itself except in enormous flocks. In small groups the birds often seemed bewildered, and it is probable that their reproductive habits were likewise affected.

*Passenger Pigeon*

← *Heath Hen*

THE HEATH HEN (*Tympanuchus cupido cupido*), an eastern relative of the prairie chicken, was last seen alive on Martha's Vineyard Island, Mass., in 1932. The tiny island had been the bird's last holdout for half a century. The final survivor was an eight-year-old bird that had been banded the year before. Prior to that, no official sightings had been made since 1928.

At one time the bird's habitat may have ranged from Maine as far south as the Carolinas. In some New England areas it had once been extremely common, but settlers soon discovered that the heath hen made a very tasty dish. Its numbers steadily dwindled as woodlands—its natural habitat—were turned into farmland and more and more birds fell to the guns of hunters. As early as 1824 a law was passed to

protect the birds on Martha's Vineyard, to which the species had probably been introduced by colonists much earlier. Annually from 1906 a census was taken of the island's heath hen population. Almost 2,000 were counted in 1916. Thereafter the population dropped swiftly; by 1925 only three birds remained.

Special efforts were made to control predators such as dogs and cats on Martha's Vineyard, but this last-ditch effort to save the birds was too late. Other environmental hazards also took their toll: excessive inbreeding, disease, an excess of males (a large brush fire in 1916 exterminated many nesting females on Martha's Vineyard), and perhaps the diminishing natural habitat.

THE LAST RECORDED SPECIMEN of an Eskimo curlew (*Numenius borealis*) was taken at Battle Harbour, Newfoundland, in 1932. It had then been 17 years since any were taken in the United States; one was collected at Norfolk, Nebraska, in 1915.

Occasionally, since 1932, there have been reports of others. In 1937 there were reliable sightings in Argentina, the bird's wintering ground. In the 1960s individual sightings were made on the Texas coast, but several years have now elapsed since any authoritative report. If any Eskimo curlews remain alive, it is unlikely that these few can perpetuate the species much longer.

At 13 to 14 inches long, the Eskimo curlew was the smallest of the American curlews—shore birds related to snipes, woodcocks, and sandpipers. It closely resembled the still extant Hudsonian curlew (*Numenius hudsonicus*), which has often been mistaken for it. The primary feathers of the Eskimo curlew, however, are clearly barred with light brown—a feature noticeable on the under surface of the wing. The summer breeding ground was the Canadian tundra; occasionally the bird ranged into Alaska. The curlew's migration route to South America usually took it past the vicinity of New York City, then out over the Atlantic. A few traveled southward over the Great Plains.

Overkill is believed to have been the main reason for the decline of the curlew, which was still common enough into the late 1800s. But natural catastrophe, such as epidemics and hurricanes obliterating entire flights of migrating birds, may have contributed to their disappearance. The curlew population may thus have been lowered to the extent that its capacity to reproduce was offset by the usual adversities, such as bird and animal predators and endemic disease.

*Eskimo Curlew*

## North American Birds on the Endangered List

| Common Name | Scientific Name | Range |
|---|---|---|
| Bald Eagle | *Haliaetus leucocephalus* | U.S., Canada |
| Masked Bobwhite | *Colinus virginianus ridgwayi* | U.S., Mexico |
| California Condor | *Gymnogyps californianus* | Southern California |
| Whooping Crane | *Grus americana* | U.S., Canada |
| American Peregrine Falcon | *Falco peregrinus anatum* | Canada to Mexico |
| Arctic Peregrine Falcon | *Falco peregrinus tundrius* | Canada to Mexico |
| Aleutian Canada Goose | *Branta canadensis leucopareia* | U.S. to Japan |
| Brown Pelican | *Pelecanus occidentalis* | Canada to Panama |
| Attwater's Greater Prairie Chicken | *Tympanuchus cupido attwateri* | U.S. |
| Bachman's Warbler | *Vermivora bachmani* | Southeastern U.S., Cuba |
| Kirtland's Warbler | *Dendroica kirtlandi* | Michigan, Bahamas |
| Ivory-Billed Woodpecker | *Campephilus principalis* | Southeastern U.S., Cuba |

Source: U.S. Fish and Wildlife Service

Drawing by Dick Roesener

# WIND

## By C. A. Bishop

FOR SOME INDIAN TRIBES of the Great Lakes region the most terrifying of all woodland creatures was the *Windigo*

*. . . that terrible, grinning ice-skeleton who working his way into a cursed man's heart, could make him long for human flesh, the flesh of his own kin. Often enough in starvation winters men had turned to cannibalism, so the Ojibwa knew* Windigo *as a very real threat.*

*. . . It was said that the potential human* Windigo *could be recognized by his greedy eating habits and his lust for overmuch fat. Later such a one could be expected to fall into deep melancholy, emerging from it finally with a violent urge to kill and eat his relatives, who looked to him . . . like lovely, fat beavers. In times of starvation, people feared their own families and feared that they themselves would turn cannibal. "Run, run!" a distressed young mother might cry*

---

*Dr. C. A. Bishop is associate professor of anthropology at the State University of New York, Oswego, and the author of* The Northern Ojibwa: An Ethnohistorical and Ecological Study; *Holt, Rinehart & Winston of Canada, Ltd., (1973).*

# IGO

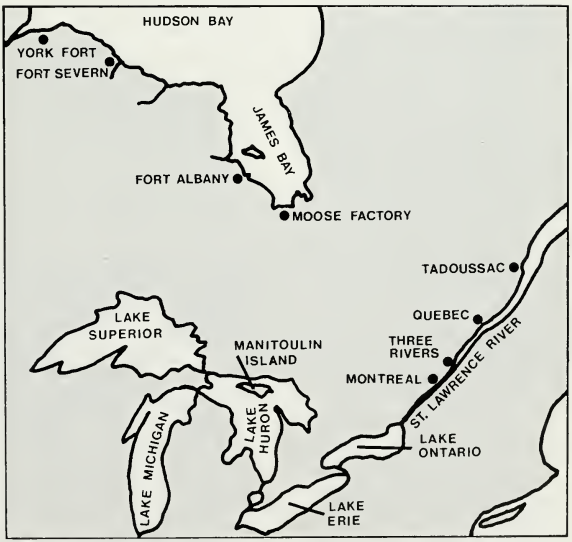
## *Cannibal Devil of the North*

*out to her children. "You all look like beavers to me!" Approaching madness, even in the summer months, caused many an old grandparent to demand death from his children. "Kill me quick with the hammer and burn me in my wigwam, or next winter I shall surely eat you." The* Windigo *could be killed, really killed, only by fire. It was the one murder no one wanted to avenge.**

Belief in this cannibal devil—and the act of cannibalism itself—antedated the coming of the first white men to North America. After their arrival, with the consequent depletion of game animals, famine as well as cannibalism became more prevalent. The Windigo was not always associated with famine conditions, since Indians were sometimes possessed by this creature even in times of plenty.

**The Montagnais Windigo**

By the 1630s the subsistence of the Montagnais Indians near the St. Lawrence settlements of Tadoussac and Three Rivers had been seriously disturbed by the depletion of game—processes that had their inception




The Hudson Bay-Great Lakes region, showing the location of trading posts where Montagnais, Cree, and Ojibwa Indians exchanged hides and meat for European wares

*From *NEW WORLD BEGINNINGS: Indian Cultures in the Americas* by Olivia Vlahos. Copyright ©1970 by Olivia Vlahos. Reprinted by permission of The Viking Press, Inc.

more than a century earlier. The fur trade was of minor importance during the late 16th century, but by 1550 Tadoussac had become the site of an annual "trade fair" where Algonquins and Montagnais exchanged furs for European wares. Trade continued off and on for another five decades. By the time Champlain and Pontgrave arrived at Tadoussac in 1603, European goods had already been conveyed far beyond the territories of those Indians in direct contact with the French. Tribal boundaries had been blurred and different groups vied with one another for key positions in the flow of trade goods.

The middleman position of the Montagnais along the St. Lawrence was partly disrupted when trading centers were set up at Quebec, Three Rivers, and Montreal. To these settlements were attracted—like bees to nectar—great numbers of Indians from many miles around. Local Indian groups were meanwhile becoming more and more dependent on European wares and foodstuffs. By the 1610s many had acquired a taste for "exotic" foods such as peas, beans, prunes, and bread. Many materials of their aboriginal culture fell into disuse, and they came to rely on French substitutes. The Indians were able to remain somewhat independent with respect to their economy and livelihood only as long as they could obtain large game.

During the summer months of the 1620s the Montagnais around Tadoussac lived on smoked moose meat supplemented by European foods. Moose, caribou, and beaver, however, were being sought by the French for their meat and hides so that by the 1630s these animals had become scarce in some areas. By 1610 the trade in beaver pelts was already thriving, between 12,000 and 15,000 skins being traded annually, and the supply of these animals near the trading centers was rapidly depleted. Indians who were accustomed to donations of foodstuffs from the French, and who were dependent on the fur trade were hard pressed to sustain themselves on local game.

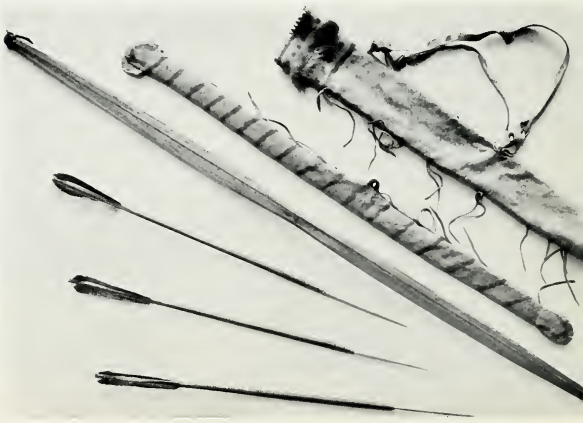
Death by starvation was the fate of many Montagnais in the Three Rivers region during the winter of 1633-34. In that winter, Fr. Le Jeune, a Jesuit, lived with a band of Montagnais who had gone to hunt south of the St. Lawrence. Here—so they had been led to believe—game would be more plentiful. According to Fr. Le Jeune, the Montagnais reported that

*Two or three families of Savages had been devoured by large unknown animals which they believed were devils; and that the Montagnais, fearing them, did not wish to go hunting in the neighborhood of Cape de Tourmente and Tadoussac these monsters having appeared in that neighborhood.*[1]

The fact that the animals were "unknown" to the Indians suggests that a specifically named cannibal giant was not involved. It is conceivable that those who initiated the rumor were merely trying to keep the dwindling game supply near Tadoussac for themselves. Starvation had thus become a serious threat to Indians around the white settlements; already there were reports of cannibalism. Some Indians near Tadoussac allegedly had eaten human flesh, while others were described as "fleshless as skeletons." There is also evidence that the social organization of the Montagnais had been modified by the altered ecology and by the drain on food resources. Groups of various sizes appear to have roamed about the woodlands at random in search of food. Meanwhile, the time-honored customs of hospitality and food-sharing were disregarded in times of stress.

From within this setting Fr. Le Jeune described what has been termed by modern investigators "Windigo psychosis." He relates that the wife of Manitou ("the great spirit") is "a real she-devil" who feeds upon the flesh of men, "gnawing them upon the inside, which causes them to become emaciated in their illnesses." Another legendary creature was Gougou, a

Cree weapons: a 59-inch bow and bone-tipped arrows. The quiver and bow case are made of deerskin. These were among the first American Indian artifacts to be acquired by Field Museum after it was organized in 1893.



female monster "taller than the masts of ships," who carried off and devoured men. However, for the psychosociologists the central idea of the Windigo psychosis is not that of a giant who literally eats people, but the belief that people are devoured spiritually and then become living vehicles for the cannibalistic spirit.

**The Cree Windigo**

The development of a similar Windigo concept is evident among the Cree Indians who lived near the Hudson's Bay Company coastal posts, especially Fort Albany, York Fort, and Moose Factory—points of convergence for large numbers of Indians. The local game, sought by Indians and traders alike, was greatly depleted soon after the posts were established in the late 17th century. The relative poverty of the coastal area Cree—except during goose-hunting season—and their dependence on trade goods and store foods in winter restricted many to game-poor areas. In aboriginal times these same impoverished areas might have been abandoned in winter. Starving Indians who camped near the post during the cold months were kept alive on oatmeal, peas, surplus goose, and fish, but in spite of such provisioning starvation among these people was still relatively common. The first clear instance of a devil known as "Windigo" appears among the York Fort Cree. The following account suggestive of Windigo behavior was recorded by William Falconer at nearby Fort Severn in 1774:

*(A Cree) threatened to stab his wife last night, and would have kill'd some of the other natives had they not bound him both hand and foot: he has appeared melancholy for some time past, and the Natives say he has several times been insane of late.*[2]

The other Indians asked that the traders put the man to death to prevent his going on a murdering spree. The request was denied but the traders did tie him up. The following day the man escaped and "frightened the other natives out of the tent." He was recaptured, however, and put to death by his relatives. When Falconer asked why they killed him, the relatives said they feared he would escape. But now that he was dead they were afraid *he would get out of his Grave and come back and kill them . . . . Their Superstition leads them so far as to imagine People deprived of reason stalk about after death, and Prey upon human flesh, such as they say are Witiko's (i.e. Divils) . . . . The above unhappy man was so distress'd for food that he kill'd his own Sister and her Child.*[2]

Steel tomahawk-pipe of European manufacture traded to the Ojibwa during the Late Historic period (after 1760). The handle is hollow; the small end of the head serves as the pipe bowl. The above specimen, 12 inches long, was acquired by Field Museum in 1893.

Assuming that the above murders were cannibalistic, a cause and effect relationship may be noted between the scarcity of food and the original cannibalistic act. It is significant that the man became a Windigo only after he had eaten human flesh. But the act of cannibalism is not in itself evidence of Windigo behavior; it is the craving for human flesh which indicates that one is possessed by this devil. Nonetheless, the belief that a human could become a Windigo seems to appear and intensify simultaneously with the fear of starvation in cases where food was being depleted, and under trade conditions where the quest for pelts stressed individualism over cooperative kinship bonds.

Under these conditions (which began in the late 1600s among the coastal Cree) the belief in, and fear of the Windigo was so intense that the potential for becoming such a monster was strong indeed. But the catalyst for the development of Windigo behavior was the decimation of game and dependency on the trading post; thus, the phenomenon had a firm ecological basis.

**The Ojibwa Windigo**

The Windigo myth of the Ojibwa appears to have had somewhat the same development as those of the Montagnais and the Cree. In aboriginal times and for a considerable period after contact with Europeans there was never a threat of starvation for most Ojibwa. They subsisted on a variety of foods in summer and on large animals in winter. Game was everywhere abundant. In 1660, for example, more than 600 moose were killed by Ojibwa in the region immediately south of Lake Superior. One French observer reported that 2,400 moose were killed on Manitoulin Island (in Lake Huron) in 1670-71. Such devastation eventually affected the game supply, so that by the mid-18th century, the area near Lake Superior had been virtually stripped of large game.

Further north the big animals lasted somewhat longer. They were sufficiently plentiful so that groups of 30 to 50 Ojibwa could remain together throughout the year. The marked decline in big game that finally did occur in northern Ontario resulted directly from the intensive competition between the Northwest Company and Hudson's Bay Company from the 1780s to 1821. During this time, game of all sorts was reduced through overhunting in an effort to supply traders as well as Indians. By the time the two companies merged in 1821, large animals as well as beaver had become extremely scarce. The relatively large groups of Indians that remained together during the 1700s had now separated into smaller family units for most of the year as the search for food and fur became more of a struggle. At the same time, the Indians became more and more dependent on provisions from the trading post.

After 1810, starvation for the Northern Ojibwa became a real threat. Cooperative sharing that had been the custom among large kinship groups became impossible in cases where families had to separate and spread out in quest of hare and other small nonmigratory animals. It was during this time that the earliest cases of famine cannibalism among the Northern Ojibwa were reported. It was also within this context during the 19th century that the classic examples of Windigo behavior were recorded among these Indians. In July 1837 more than 100 Ojibwa arrived at the Lac Seul post after fleeing in terror from a Windigo which several had reported seeing at their summer camp.[3] They set up their new camp next to the store and posted sentries. For a week the medicine men engaged in conjuring to ward off the evil monster The trading post, then, where food could be obtained in time of need, had become a haven and a symbol of protection against the dread giant. Some disagreement existed among the Ojibwa hunters concerning the physical features of the Windigo, suggesting perhaps that the Windigo myth had been relatively insignificant in earlier times.

There is every reason to believe that cannibalism among these Indians was a normal response within the abnormal situation of starvation. But the distinction must be made between cannibalism as a consequence of famine conditions and Windigo cannibalism: The former occurred only in times of extreme food shortage, while the unspeakable terror of Windigo cannibalism could strike in times of plenty as well as during periods of famine.

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The author wishes to thank the Governor and Committee of the Hudson's Bay Company for permission to cite from their archival sources.

"Windigo—Cannibal Devil of the North" is adapted from Dr. Bishop's paper "Ojibwa Cannibalism," presented at the IXth International Congress of Anthropological Sciences, which convened in Chicago Aug. 28-Sept. 8, 1973. The paper is subsequently to be published by Mouton & Co. of The Netherlands.


Ojibwa birchbark wigwam. Probable date of photograph: 1893.

# CHICAGO'S FIRST NATURALIST

**and the grove which could serve as a fitting memorial to him**

Robert Kennicott

By W. J. Beecher

VIRGIN PRAIRIE once covered two-thirds of the state of Illinois; but the steel moldboard plow—invented by John Deere in the 1830s—was so efficient that virtually the entire prairie was under cultivation by the 1880s. It is well-known that, once prairie land passes under the plow and the ancient roots of grasses and other herbs (penetrating the ground as much as 12 feet) are severed, prairie plants do not again come in, but are succeeded by Eurasian weeds. Thus the plow effectively destroyed the prairie nearly a century ago.

So it was with great jubilation that a number of us, who had been searching for prairie remnants along railroad rights-of-way, recently discovered two square miles of prairie near Morris, Illinois. After a long publicity campaign, we succeeded in persuading the state to buy Goose Lake Prairie. There was something a bit pathetic about the public response. A housewife volunteered to write letters to save the prairie; someone else offered, anonymously, $1,500,000 interest-free to enable the state to buy the land immediately and reimburse him later. In a time of fatal decision it seems that something almost genetic in man, affirming his kinship with the soil, comes forward and causes him to draw back from the brink. Since the acquisition of Goose Lake Prairie an embarrassing number of "last" prairies have been discovered in and around Chicago; several additional small ones have been acquired through the efforts of various citizen groups.

But something has been missing—the prairie had been a shining sea of grass, spangled by a luxuriant tapestry of wildflowers rolling out to the horizon. The descriptions of the early pioneers dwelt often on the visual relief afforded by the prairie groves, which were made up in part of thick-barked bur oaks that could withstand the frequent prairie fires. The rollicking songs of meadowlark and bobolink, along with the dancing flowers, made the prairie a gay place—but perhaps the sky was too big. The communities that sprang up were generally located at the edges of the groves and have come down to us as place names: Morton Grove, Fox River Grove, Downers Grove.

Authentic wild groves surrounded by prairie remnants are in the 1970s at a premium. I know of only one that is near Chicago—Kennicott's Grove—and I know of it particularly because my predecessor, Robert Kennicott, first director of the Chicago Academy of Sciences at its founding in 1857, was born there.

I first visited the grove in the mid-1930s as a member of the Kennicott Club, a natural history society named for Chicago's first naturalist. We had been invited to see it by Donald Culross Peattie, the nature writer, who had married into the Redfield family and lived there. Much later (in the 1960s) I visited the grove with my old friend, Hiram Kennicott, a cousin of Robert's. On both occasions I was impressed with the fact that much of the grove remained in a comparatively natural state. In my mind's eye I could almost see young Robert demanding of his sisters that they shake out their voluminous skirts and petticoats on the porch after running about in the prairie, so that he could collect the insects gathered. I am not aware that any of the Kennicott insects thus collected have come down to us, though a small collection of his birds, including prairie chicken, Carolina parakeet (extinct),

*Dr. W. J. Beecher is the director of the Chicago Academy of Sciences.*

A pair of ducks enjoy the tranquillity of the pond in Kennicott Grove.

and passenger pigeon (extinct), survive in the Academy collection.

In the grove young Robert grew up pretty much like an Indian. A sickly boy, he was not required to go to school. His father, Dr. John Kennicott, preferred to tutor him at home. Dr. Kennicott was a prominent horticulturist and editor of *Prairie Farmer* magazine, and the grove became a meeting place for famous naturalists of the day. Out of this came an offer for Robert to understudy at the Smithsonian in Washington with its secretary, the famous Spencer Fullerton Baird. There, with others later to become great naturalists, such as William Stimpson, he founded the Megatherium Club—occupying a small cottage near the museum. Here, in an atmosphere of frequent hilarity, the impecunious young men lived beween 1854 and 1858. Robert's first professional paper was a natural history survey of the reptiles, small mammals, and birds to be found along the right-of-way of the Illinois Central Railroad from Chicago to Cairo. When the Chicago Academy of Sciences, "the first museum in the West," was founded in 1857 at the suggestion of the legendary Louis Agassiz, Robert Kennicott was appointed its first director. He then spent several years on collecting trips in Illinois, Minnesota, and northern and western Canada. Between 1862 and 1865 he divided his time between the Academy and the Smithsonian, classifying his material; and in 1865 he undertook to head the survey expedition of the Western Union Telegraph Company to Alaska—then Russian territory. A route was laid out for a telegraph line that would cross the Pacific by way of Bering Strait, where it would connect with one laid by a Russian team working eastward across the wastes of Siberia.

The successful laying of the Atlantic cable by a rival organization, after several failures, beheaded the vast enterprise at the cost of millions. Alaska was then so remote that it took six months to transmit the order to the field party to stop stringing telegraph wire. But the collections of Kennicott in Chicago and in Washington became the concrete basis for Secretary of State Seward's successful proposal to purchase Alaska.

Kennicott himself did not survive the Alaska experience. One sees this high-spirited young man, ever merry and the favorite of his companions, paddling alongside Canadian voyageurs in huge birchbark canoes up the Athabaska River at 50 strokes a minute, shouting "Alouette!" Or we see him on Christmas morning, 1862, dog-sledding along the banks of the Peel River, smoking his last remaining cigar to the health of the family circle back in the grove. On May 12, 1866, his body was found face-down on the shore of the Yukon at Nulato, his compass nearby and bearings to the local peaks traced in the sand. He was dead at thirty of a heart attack.

A couple of years ago a record book of Robert Kennicott's father was discovered. In it were inscribed by date the origin of certain horticultural plantings in the grove and where the stock was obtained—some entries going back to the 1840s. These records add a unique scientific value to the primarily wild area of the grove. There is no question, however, that the old Kennicott homestead is a typical prairie grove. As to dominant tree form, it is almost entirely made up of bur oak, with low marshy glades and a willow-bordered pond. The size of the grove is ideal for the creation of a nature center with historical overtones; it would show how early residents in prairie groves made their accommodation with the natural environment. No more fitting memorial to Chicago's first naturalist could be proposed than this grove set aside in its present state, housing there various memorabilia of Robert Kennicott—for example, enlarged passages from his voluminous letters.

# LETTERS

A member reminisces

*The following exchange is between Museum life member Alan D. Whitney and John R. Millar, retired deputy director of the Museum and chief curator of botany.*

Dear Mr. Millar:

Having enjoyed your article in the June Bulletin, I decided to write you and mention a few of my own recollections of the old Museum in Jackson Park. I was born on the South Side on Oct. 30, 1893, the last day of the Columbian Fair. My mother attended it on Chicago Day, the 9th, and was warned I might arrive unduly at the fair in the excitement and huge crowd, but I bided my time. I still have the 1¢ postal card my father wrote that day to one of my uncles, announcing my arrival, and ending with "presume he came for the Fair and just made it by a scratch."

I grew up on the South Side and in my late teens we moved to the vicinity of Jackson Park, at 54th and Everett. I attended the old museum building many times in my youth and recall exhibits long since discarded, mummies, Indian artifacts, railroad trains, etc. I even saw the Ferris Wheel, after it was moved to the North Side, and before it was taken to St. Louis, in 1904. As luck would have it, Dr. Charles F. Millspaugh [the Museum's first curator of botany] and wife lived in our building.

I saw the old museum being vacated and dismantled, and saw the temporary RR track which ran from it to the ICRR across Stony Island Ave. I took photos of the construction of Rosenwald Museum on the same site and with part of the same walls. I courted more than one girl in the area, and when I became engaged to a girl also from the South Side, I took motion pictures of her in and around the museum then being rebuilt.

About 25 years ago I met Eugene Richardson [curator of fossil invertebrates]. He was co-leader with me in the Great Books course in Winnetka then. His ability to read the texts in the original Greek intrigued me, and forced me to try my hand a bit at that art. I taught myself to read enough so that when we went to Greece in 1960 and again in 1964, I could decipher parts of the old inscriptions . . . . I became a member of the Museum a few years ago (and) in recent years became a life member.

Alan D. Whitney
Winnetka, Ill.

Dear Mr. Whitney:

Your reminiscences of your youth and early events in connection with the World Columbian Exposition and the Museum are most interesting and awaken some nostalgic thoughts of my early days. When I began employment at the Museum in 1918, I lived on the North Side, rode the el. to 63rd and Stony and walked from there to the Museum in all kinds of weather.

Please address all letters to the editor to

*Bulletin*
Field Museum of Natural History
Roosevelt Road and Lake Shore Drive
Chicago, Illinois 60605

The editors reserve the right to edit letters for length.

During lunch hour I and Homer Geib, another young man employed at the same time, explored the park and all there was in it, the German Building, the Japanese Tea House, Wooded Island, the Viking Ship, Columbian caravels, and of course every nook and corner of the Museum.

My first visit to the Museum occurred when, as a grade school pupil, I and a classmate took our respective girls there on a Sunday afternoon. We fed our morbid curiosity about death and the human body with awesome viewing of mummies, especially the unwrapped ones, and fed our dreams of adventure in faraway places with sight of native costumes and weapons. It was a tremendously stimulating experience that I can still recall vividly. The fact that each generation of young people must go through an equivalent phase in their lives and development makes museums and their exhibits of continuing value as adjunctive educational institutions.

John R. Millar
Longboat Key, Fla.

An exhibition case is moved from the Museum's first home, the Palace of Fine Arts, into a freight car for transport a few miles up the lake shore to the new Field Museum building. Photo taken about 1919.

## Anthropology Program for High-Schoolers

David Lawrence Pitrak, Oak Lawn Community High School, and James Gerard Graham, Evergreen Park High School, both juniors, learn about American Indian techniques for making rope at Field Museum of Natural History. They are participants in a six-week Student Science Training Program in Anthropology offered by Field Museum's Department of Education and supported by the National Science Foundation. David and James were chosen for the free course on the basis of academic achievement, teachers' recommendations, and personal interviews. The program features lectures by noted authorities, seminars, workshops, individual projects, study of artifacts, and a week of supervised archaeological field work at a local site.

## Elizabeth Girardi Museum Volunteer, Awarded Doctorate

Several years ago Mrs. Elizabeth Louise Girardi began as a volunteer worker in the division of invertebrates. Encouraged by Dr. Alan Solem, now curator of that division, Mrs. Girardi entered upon graduate studies and, in August of this year, was awarded a PhD from Northwestern University. Her thesis on "The Genus *Ostodes* (Mollusca, Gastropoda) in Western Samoa" was based on materials collected by Dr. Solem and staff under National Science Foundation sponsorship.

## Field Museum Celebrates 80th

On September 16 Field Museum of Natural History begins its ninth decade, for on that date in 1893 the incorporators of the Museum (then the Columbian Museum of Chicago) were granted a state charter. In its 80 years the institution has grown to become one of the world's most important museums—both as a scientific research center and as a repository for specimens and artifacts.

## Journals Exchange with Peking

About twenty years ago Field Museum and the Academia Sinica in Peking, People's Republic of China, initiated an exchange of technical publications: *Fieldiana* (Field Museum's continuing series) going to Peking, and four Chinese journals coming to the Museum library. As a result of the "cultural revolution" in China in 1966, few scientific publications were printed and none were sent to our library.

Through it all, however, the Museum continued to send its publications to the academy and to its Institute of Vertebrate Paleontology and Paleoanthropology.

In February of this year Mr. Peyton Fawcett, Museum librarian, wrote to the Academia Sinica concerning the journal exchange and was informed that the academy had been receiving *Fieldiana* without interruption! He also received assurance that the Museum would again be getting those journals that had been interrupted earlier, issues of which have been received.

## Lorin I. Nevling, Jr. Named Chairman of Department of Botany

On July 1 Dr. Lorin I. Nevling, Jr., formerly of Harvard University, became the new chairman of the department of botany at Field Museum. At Harvard he had been a faculty member since 1966 and lecturer in biology since 1969. He was appointed assistant curator of Harvard's Arnold Arboretum in 1959 and subsequently became curator. Dr. Nevling also served as associate curator, then curator, of Harvard's Gray Herbarium.

Dr. Nevling was born in St. Louis, received his BS from St. Mary's College, Winona, Minnesota; and his AM and PhD from Washington University in St. Louis. He is a member of the American Association for the Advancement of Science (Fellow, 1967), the Linnaean Society of London, and the Sociedad Botanica de Mexico. At Field Museum, Dr. Nevling will continue his work on the "Flora of Veracruz," an ecologically oriented flora which is a cooperative study with scientists of the National University of Mexico. This project is supported in part by a recent grant from the National Science Foundation.

Dr. Nevling succeeds Dr. Louis O. Williams, chairman of the department since 1964. In his new capacity as curator of Central American Botany, Dr. Williams will devote full time to his 15-volume work, *Flora of Guatemala*, a comprehensive survey which he hopes to complete by 1976.

## Singer Collects in Ecuador

While several of his colleagues in the Department of Botany were collecting in Central America, Dr. Rolf Singer, visiting curator in mycology (the study of fungi), was on a National Science Foundation-supported field trip in the Ecuadorian headwater regions of the Amazon, and in the Andean provinces of Pichincha and Tungurahua.

(Only two mycologists had previously been in the area—both more than half a century earlier.)

During his work in eastern Ecuador Singer was stationed at the village of Lago Agrio on the Rio Aguarico, an Amazon tributary, where he was guest of the Texaco Oil Company. His primary objective was to collect fungi of the class Basidiomycetes; secondarily, he took soil samples, which, by the type of fungi they contained, might indicate the likelihood of the presence of petroleum deposits.

## "The Naked Ape" Filmed at Field Museum

Several scenes from "The Naked Ape," a commercial film soon to be released to theatres were filmed at Field Museum last year. The movie is based on a book of the same title by British zoologist Desmond Morris.

## John White Joins Department of Education

Field Museum's new coordinator of native American programs in the department of education is John White. The new program, funded by a grant from the W. Clement and Jessie V. Stone Foundation, will attempt to utilize Field Museum as a cultural resource for the Indian community, and will involve a close working relationship with other Indian educational groups in the city. A major project under Mr. White's direction will be the development of a comprehensive illustrated catalog of the North American Indian materials in the Museum's collection.

A native of Philadelphia, Mr. White is of Cherokee (Chickamauga Band) and Scottish descent. He received his MA from the University of Chicago in a combined education and anthropology program; his thesis was on "The American Indian in Chicago—the Hidden People." He has also completed work toward his PhD at Stanford.

## Moonlet Acquired 75 Years Ago

Field Museum's miniature moon, still to be seen in Hall 35, was donated to the Museum 75 years ago. The 19-foot model, made in Germany, is so accurate in detail that none of the photos taken by astronauts during the Apollo moon missions has revealed features in disagreement with those shown on the model's surface.

On the occasion of the model's acquisition in 1898 the following statement appeared in that year's annual Museum report:

*"In geology, the gift of Mr. L. W. Reese, of Chicago, of the Schmidt-Dickert relief model of the moon is a notable acquisition. This great model, 19 feet in diameter, exhibits with scientific accuracy the surface features of the moon. It was prepared with great care from the charts of Beer and Madler and of Dr. Schmidt of the Athens Observatory, undoubtedly the greatest authority upon the topography of the moon of his time. Five years were occupied in its construction."*

(For further information on the curious history of this model see the February 1970 *Bulletin*.)

## Plan ground-level access for handicapped visitors

"The 38 steps"—not a Hitchcock thriller but a real frustration to approximately 600,000 Chicago-area residents who cannot presently visit Field Museum without hardship and inconvenience to themselves and to the people accompanying them.

The 38 steps lead up to the Museum's two main entrances. But for visitors confined to wheelchairs or crutches, or who are pregnant or on the mend from a broken limb, or who are still in the toddler stage or have advanced to their senior years, those 38 obstacles are sufficient to often deter them from an exciting, thought-provoking tour through the Museum.

But, thanks to many generous contributors to the Museum's $25-Million Capital Campaign now in progress, the Museum will soon have a ground-level entrance to better serve these potential visitors. It will be one level lower than, and just to the north of, the present entrance to the lobby of the James Simpson Theatre on the west side of the building. The new entrance will feature pull-type doors with a clearance of 36 inches wide or more.

"The creation of ground-level access to Field Museum will be the attainment of a long-sought goal," said Museum Director E. Leland Webber. "As early as 1943, our architects studied the feasibility of such access, but the project has been deferred through the years because of lack of funds. Now, through the generosity of many Chicagoans, this important improvement is nearing reality."

The new entrance facility should be completed by the end of next year. In the meantime, handicapped visitors, through prior arrangement, may enter the Museum via the service elevator, and use a Museum wheelchair for the day.

Many other aids to persons with limited mobility are included in the Museum's renovation plans. There will be two public passenger elevators to replace the present single, small elevator. Each will have group-size doors and capacities of 30 persons. In addition, wide restroom stalls with grab bars, low drinking fountains and pay telephones, and wide doors will enhance a Museum visit for mobility-limited persons. It is also hoped that the Simpson Theatre can be equipped with a lift backstage for patrons who cannot enter via the lobby stairs.

These renovations are parts of 27 major projects that will update the Museum for the 1970s and decades to come. Half of the money is being generated through private gifts, the other half is public funds through the bonding authority of the Chicago Park District.

Architect's rendering of Field Museum's west entrance as it will appear in the near future. Access to the building by this entrance will be at the ground level, making it possible for persons in wheelchairs and on crutches to visit the Museum with minimum difficulty.

# CALENDAR

## Exhibits

Closes September 30

**Seventeen-Year Cicada: A Strategy for Survival,** a multi-media exhibit describing and interpreting the adaptive significance of the unusual life cycle of these strange insects. Millions of cicadas made their noisy appearance above ground in the Chicago area early in June. Hall 9.

**Adaptations of Amphibians and Reptiles,** an exhibit of photographs portraying the natural beauty and aesthetic qualities of these animals, as well as illustrating some of their often remarkable and unique adaptations which help them survive. They were taken by Dr. Nathan W. Cohen, Chairman, Department of Continuing Education in Sciences and Mathematics, University of California, Berkeley. Hall 27.

Continuing

**Field Museum's Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past, and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Children's Program

Begins September 1

Fall Journey for Children, a free self-guided tour designed to acquaint youngsters with Museum exhibit areas. All boys and girls who can read and write may join in the activity. Journey sheets available at entrances. Through November 30.

## Meetings

**September 11:** 7:30 p.m., Nature Camera Club of Chicago.

**September 12:** 7 p.m., Chicago Ornithological Society.

**September 12:** 7:30 p.m., Windy City Grotto, National Speleological Society.

**September 13:** 8 p.m., Chicago Mountaineering Club.

**September 25:** 7:30 p.m., Nature Camera Club of Chicago.

## Coming in October

**Fall Film Lecture Series,** offered at 2:30 p.m. every Saturday in the James Simpson Theatre. **"The Epic Voyages of Ra"** will also be presented at 7:30 p.m. Friday, October 19.

October 6: **"In the Heel of the Northeast Trade,"** (Palau Islands, Micronesia), narrated by Dr. Kenneth R. H. Read.

October 13: **"Hawaii,"** narrated by Doug Jones.

October 19 and
October 20: **"The Epic Voyages of Ra,"** narrated by Comdr. Norman Baker.

October 27: **"Minnesota Valley Saga,"** narrated by Dr. Walter J. Breckenridge.

**Hours**

9 a.m. to 9 p.m. Saturday and Sunday, September 1 and 2, and 9 a.m. to 6 p.m. Monday, September 3 (Labor Day). Remainder of month 9 a.m. to 5 p.m. Saturday through Thursday, and 9 a.m. to 9 p.m. Friday.

The Museum Library is open 9 a.m. to 4:30 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

Museum telephone: 922-9410

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# Field Museum of Natural History Bulletin

**Field Museum of Natural History Bulletin**

Volume 44, Number 9
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## contents

**REHABILITATION** 3
The first large-scale modernization program in the history of Field Museum
An interview with **William B. Dring**

**SCARABS** 8
Sacred and otherwise
By David M. Walsten

**SPANISH PREHISTORIC ART** 13
Introduction to a new exhibit
By G. Henry Ottery

**BOOK REVIEWS** 15

**RAY A. KROC ENVIRONMENTAL EDUCATION PROGRAM** 16

**CHILDREN'S WORKSHOPS** 17

**FIELD BRIEFS** 18

**CALENDAR** 19

## COVER

The date: May 2, 1921. The event: Opening day of Field Museum's new building. Chicagoans, like pilgrims journeying to a shrine, make their way to the doors of the Museum, across the "barrens" of what is to become Grant Park.

Today, a half-century later, Field Museum has grown to become one of the great scientific meccas of the world. Completion of the Museum's $25 million rehabilitation program (described in the following pages) will do much to ensure the institution's continued growth as an educational and research center.

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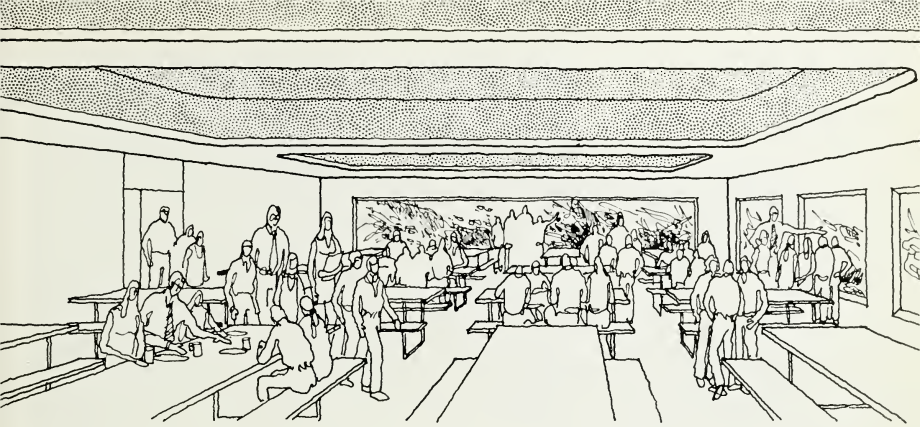

Architect's visualization of new lunchroom planned for Field Museum

# *Rehabilitation*

The first major modernization program in Field Museum's history is explained by architect William B. Dring of Harry Weese & Associates.

**Editor:** The goal of Field Museum's Capital Campaign is $25,000,000—funds to be used in rehabilitating the Museum building. Could you summarize the major aspects of the construction program and explain how this will affect Museum visitors?

**Dring:** Probably the most obvious changes as far as Museum visitors are concerned will be the renovation of the public spaces. Virtually all of the public service areas will be affected. Included in the program is an expanded new cafeteria, modernization of James Simpson Theatre, and expansion and renovation of the educational facilities, including new classrooms and lecture halls, new children's lunchrooms and a new ground-level entry for children's groups and mobility-limited persons at the west side of the building. The other public spaces to be affected are the north and south entries where new coat-checking facilities are planned. New elevators will serve the three public levels of the building. The present bookstore is to be enlarged. A new bookstore at the south entrance and a children's bookstore on the ground floor are also planned.

Less visible to the public will be the expansion of the scientific departments. This will include substantial enlargement of the curatorial offices, laboratories, and collections storage areas for each of the four scientific departments (zoology, botany, geology, and anthropology).
A third aspect of the building program is consolidation of departmental offices. Due to incremental expansion over the years, these departments tended to spread around the building and become physically decentralized, causing problems in staff communication yet not really providing adequate space. Under the new program, each of the departments will be

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*Harry Weese & Associates is the architectural firm in charge of the rehabilitation project. The firm has been involved in many major renovation projects in Chicago, among which are the Auditorium Theater, Orchestra Hall, and Newberry Library. Mr. Dring is project manager for the Field Museum's rehabilitation program.*

consolidated into contiguous facilities. The administration, education, and development offices will be on the ground floor. The Department of Exhibition's new offices are already completed and in use at the south end of the fourth floor.

Along with the construction of the new facilities there is a continuous program of renovation of the physical and mechanical plant. This will include repair of some fairly minor structural deterioration and will also include such major items as a complete air conditioning system, and almost total renovation of the electrical system.

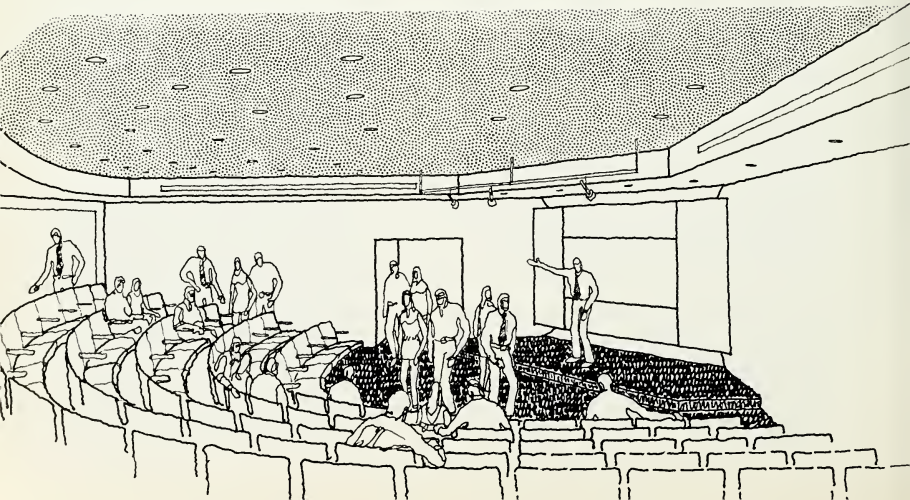
The last major aspect is an outgoing program of exhibition renewal. The Museum has a very strong commitment to the exhibition program and has budgeted a rather large portion, about $5,000,000 of the $25,000,000 capital campaign funds, to exhibition renewal. Part of this money will be used for physical renovation of the halls: new lighting, acoustical treatment, and repainting.

Ed.: What is the overall timetable for the construction program?

Dring: Part of the work has been completed. In addition to the new work areas for the Department of Exhibition, we have also completed new offices and storage areas for the Division of Invertebrates, and a laboratory for the new scanning electron microscope. Conversion of the boilers from coal to gas has been completed. Just recently the Museum has entered into a contract for eight new fire exits and repair of the north and south steps. By the end of the year we hope to have the air conditioning, the electrical renovation, additional curatorial space, and most of the ground floor work under contract. All of these are phased projects which are scheduled to be in construction over the next several years. In total these represent about 65 percent of the building program, all under contract this year!

Ed.: What will be the effect of all this construction activity on the staff and visitors?

Lecture hall II will feature seat rows in semicircular tiers.



Laboratory in the Division of Invertebrates. Modernization of this section, including offices and collection storage areas, has recently been completed.

**Dring:** The phasing of the work for minimum disruption is a complicated matter. We're rebuilding the cafeteria in a new location so that the present facilities can be in operation until changeover. We're using the same techniques in building new facilities for the curatorial staff because their collections are very sensitive and could not tolerate exposure to the dust of construction. Remodelling and expanding the offices is a different problem; many of the staff will have to occupy temporary offices during a portion of the construction program.

It is fortunate that the Museum has chosen "construction management" as a method of monitoring the construction process and has hired Turner Construction Company for this responsibility. Construction management essentially means hiring a construction firm as part of a team, with responsibility for cost control and assisting in scheduling and in coordination between the various contractors.

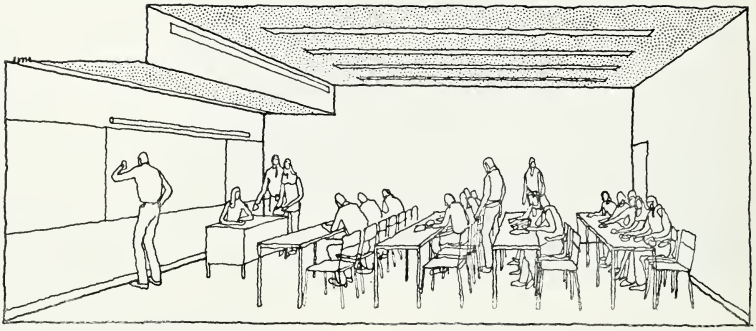
**Ed.:** What was your overall approach in master-planning the rehabilitation program?

**Dring:** An early part of the study, of course, was an analysis of the building itself. The Museum is very fortunate to have such a truly remarkable building. Though the classic style was hardly avant-garde when the designs were started in 1905, the original architect, Daniel Burnham, created a magnificent Greco-Roman structure that has a timeless quality which will always be "in style." I've been working with the building for more than five years now, and am continually impressed with the clarity and integrity of the plan. The public spaces are arranged like fingers—always leading back to Stanley Field Hall for orientation. Stanley Field Hall itself is one of the finest indoor spaces in the country.

Early in the design process we decided, with the Museum administration's blessing, that any visible expansion outside the building would be undesirable. Fortunately, within the building the large lightwells, now rendered obsolete by modern exhibition lighting techniques, are available. They offer large clear spaces where new floors could be installed, and the existing structure could easily take the load. All in all, the lightwells offer an increase in floor area of 19 percent!—even more than the present program requires. And beyond that we could also consider expansion under the exterior terraces. These expanded areas would also be "invisible."

Our overall philosophy is to work within the present design fabric, saving existing design elements and ornamentation. Occasionally we must insinuate modern facilities into strong design areas, such as the rest rooms which were added as part of the new lounges on the second floor overlooking Stanley Field Hall. There we even copied and extended existing ornamentation to be as discreet as possible.

In James Simpson Theatre we are planning to modernize and update the facility but still save the existing form and ornamentation.



New classrooms are among the public service areas to be included in the Museum rehabilitation program.

In most areas we are not in conflict with the original architecture. On the ground floor, for instance, there is no strong architectural detailing. We felt we should preserve the basic symmetry of the circulation pattern, but the new architectural elements could be totally modern.

Ed.: Your plans show a new glass wall to enclose the north entry portico. What is the reason for this?

Dring: This is probably the only area where the modern will come hard up against the original, but we believe that the two will meet very well. The main reason for this addition is that it solves a very basic circulation problem that was not adequately solved in the original design.

A large number of persons enter and leave the building at this point; traffic here is further congested by the coat checking, the bookstore, and ticket-taking functions, plus the guard's desk which mediates access to the nonpublic areas of the building. Our proposal to solve these problems was to enclose the exterior portico. We're providing a desk and special elevators in an alcove at the side to serve the staff and visitors to the nonpublic areas.

The bookshop will be entered at the east side of the north entrance. All the congestion inside the bronze doors will be avoided, allowing easy access to the grand stairs and a suitably dignified approach to Stanley Field Hall. The glass wall we are adding to enclose this new space will be the most visible change to the exterior, but by holding the glass behind the outer row of columns, we expect that it will not dominate the scene.

Ed.: What about the not-so-visible changes—the air conditioning, for example.

Dring: The decision to air-condition the building was made very early. There was concern for the comfort and efficiency of the staff and the Museum's visitors, but the primary reason for air conditioning is the need to preserve the invaluable collections of the Museum. Most of the specimens, particularly those which are organic in nature, require a stable environment. Extremes of temperature and humidity could, over a period of time, cause severe deterioration to many of these virtually irreplaceable objects. The collections are housed not only in the scientific areas but throughout the exhibition halls, making total air conditioning almost mandatory.

The Museum sought the advice of the many experts in the field of conservation, and engaged Dr. Nathan Stolow as a consultant. Dr. Stolow is director of the Canadian Conservation Institute of the National Museums of Canada and is a world authority on the preservation of works of art and natural history objects. He surveyed the collections and made a series of recommendations as to the proper environment for each of the various types of specimen. Our engineers have designed an air conditioning system that can meet these critical needs but which can also be throttled back for economy if any area were to be converted to more standard use.

We tried to design the air conditioning system into the existing fabric, again, as discreetly as possible. For the air conditioning cooling tower we were able to use a lightwell above James Simpson Theatre. In planning the distribution of the large pipes and ducts we were equally fortunate. We found that the corners of each of the old lightwells could be extended down to the first floor and the ground floor with almost no impairment of the visual aspects or working qualities of the building. These shafts reach almost everywhere and will serve perfectly to conceal most of the equipment.

Also, we are reserving two of the shafts for the new public elevators. The shafts are so perfect for the task that it almost seems that the original architect, more than half a century ago, foresaw this future need.

Ed.: With the completion of the rehabilitation program, Museum members will take pride in the fact that their modernized building will be one of the best equipped and most up-to-date institutions of its kind in the world.

The fulfillment of members' dreams for a fully modernized building is predicated on the successful completion of the Capital Campaign. The Campaign's goal is $25 million—half to be privately donated, the other half to be provided by the bonding authority of the Chicago Park District on a matching basis. So far, through the generosity of individual, foundation, and corporate donors, more than $10 million has been subscribed—a truly remarkable demonstration of faith and interest in Field Museum. Nearly $2.5 million from private sources is still to be raised by September 1974, however. In the months to come, each of us must consider how we can individually participate in the achievement of this goal.

## *CHICAGO'S BIG GIVERS*

*The immediate future of Chicago is an interesting study for observers. All eyes have been centered upon her now for six months, and in a less degree for nearly two years. Her purposes and her methods of carrying them out have been matters of national moment. It is hardly too much to say that she has been the most important city in the land, and of course she has felt her importance. What will become of her now? Will she drop gracefully down to hard pan and become once more a comparatively commonplace big western town or will she keep right on and strive by tremendous hustling to maintain the central and commanding position which was lent her by the fair? Of course that remains to be seen, but she has given some evidence already that she does not intend to drop an inch farther than she can help. Marshall Field's subscription of a million dollars to found a museum of natural history may be accepted as an indication of her sentiments. It is proposed to make the museum a memorial of the fair and perhaps to house it in the Art Building at Jackson Park. Mr. Pullman follows Mr. Field's subscription with one of a hundred thousand dollars, and doubtless before this reaches the reader's eye the entire sum of two millions called for will be made up. What extraordinary givers these Chicago men are! It is exhilarating even at this distance to see the superb confidence with which they back up their town. Other cities get bequests now and then, but Chicago's rich men have not had time to die, and neither she nor they can wait for that. They want to see that investment in actual being. If any eastern listener is holding his ear to the ground to catch the thud of Chicago's coliapse, he might as well get on his legs again and go about his business. There isn't going to be much of a thud. Those amazing hustlers are still at it, and though their tide may ebb a little for a time it is bound to flow again in due season.* —Editorial from *Harper's Weekly*, Nov. 11, 1893.

# SCARABS Sacred and Otherwise

By David M. Walsten

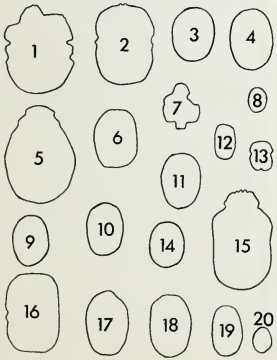
EARLY IN THE 19TH CENTURY Lord Elgin—the British Museum's dedicated collector of antiquities—found in Constantinople a boulder-size green granite replica of a beetle. It measured about five feet long and weighed more than two tons. The sculpture is possibly the largest carving of a beetle ever made, and is believed to have originally come from the temple of Heliopolis in northern Egypt.

Elgin's colossus represented an insect known to entomologists as *Scarabeus sacer* and commonly called (along with a number of similar species) the dung beetle, or tumblebug. Because it held religious significance for the ancient Egyptians the beetle also is known as the "sacred scarab." At least three other species were also used by the Egyptians as models for amulets, talismans, seals, tablets, and pedestals. The family to which all of these belong is known as Scarabaeidae, a group that comprises more than 20,000 species (about 1,300 in North America). All of these beetles, too, are properly called scarabs.

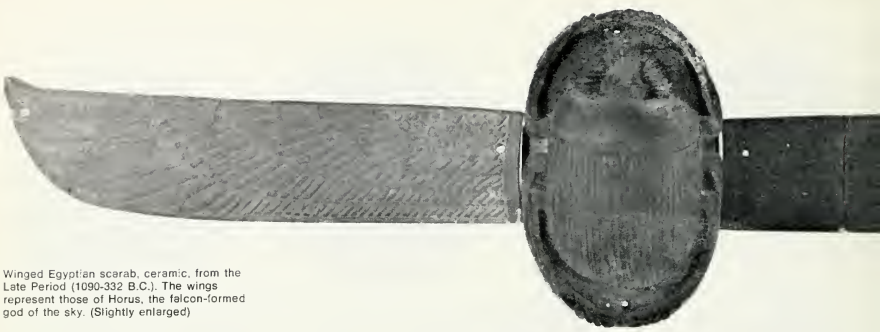
Perhaps no instance of religious symbolism could be described as more curious than the ancient Egyptians' identification of *S. sacer* with Khepera, their god of creation. The beetle's seemingly playful habit of rolling a ball of dung along the ground was believed to represent Khepera's divine task of rolling the sun across the sky. The ball, in time, magically produced another beetle; the Egyptians probably did not notice that an egg had been inserted into it weeks earlier.

The beetle grub used the ball as food —a miniaturization of heat and life springing from the sun. Thirty structures on the beetle's legs were thought to

Over a period of more than 3,000 years the Egyptian scarab was fashioned in a variety of styles, in a great range of sizes, and from many materials. Those shown (actual size) at the left, selected from Field Museum's collection, were probably made ca. 1570-500 B.C. See key below. (1) faience; (2) mottled argillite?; (3) faience; (4) granitic; (5) blue ceramic; (6) serpentine; (7) faience, with sun disk above and threading loop in shape of infinity sign; (8) faience; (9) serpentine; (10) amethyst; (11) wood; (12) translucent paste; (13) lapis lazuli; (14) wood; (15) faience; (16) altered volcanic rock; (17) quartz-feldspar; (18) wood; (19) jade?; (20) faience.




Greenstone scarab, top and bottom, from about 1000 B.C., showing beautifully incised hieroglyphs on the lower side. (Enlarged about twice)



Winged Egyptian scarab, ceramic, from the Late Period (1090-332 B.C.). The wings represent those of Horus, the falcon-formed god of the sky. (Slightly enlarged)

represent the days of the month. The number of days in the month was also said to be represented by the number of days before a new beetle emerged from the ball. All scarabs were supposedly males; by virtue of their divine power they were able to perpetuate themselves without female assistance.

Images of the beetle—a stout black insect about an inch long—were made from a great variety of materials, including ivory, wood, ceramics, colored glass, gold, and stone. Stone scarabs were of basalt, granite, diorite, hematite, lapis lazuli, carnelian, jasper, agate, soapstone, onyx, and quartz. The great majority were from half an inch to two inches in length. Some replicas had wings of the sacred falcon Horus. Others bore a ram's head and horns. Khepera is sometimes represented as a man with a head in the likeness of a scarab. The bottom of scarab replicas is usually flat and smooth, but many are inscribed with hieroglyphs or with other figures. Anatomical features of the beetle's lower side are sometimes represented in stylized fashion.

Scarabs have been found on habitation sites as well as in tombs. The oldest known amulets date from at least as early as the first half of the fourth millenium B.C., and jars of embalmed scarab beetles also date from this period. The use of scarab replicas as amulets became common during the XIth or XIIth dynasties (2133-1786 B.C.); around the XXVIth dynasty (664-525 B.C.) they passed out of vogue. Hundreds of large scarabs were made during the reign of Amenophis III (about 1450 B.C.), memorializing such events as his marriage, the digging of an artificial lake, and various hunting trips.

Scarab amulets were worn on the person to promote general well-being and to ward off evil. Warriors carried them to bolster their courage. Some were inscribed with the name and title of their bearer. Others had the name of a pharaoh, or a motto or good luck phrase carved into them, such as "May your name endure and a son be born to you." Because the beetle symbolized life itself, scarab amulets were often placed with the dead. The so-called heart scarab was placed on a mummy's breast, among its wrappings, or put inside the body in place of the mummy's heart. The bottom of the heart scarab was inscribed with a passage from the sacred Book of the Dead, in which the deceased petitioned his heart not to bear witness against him at the time of final judgment. Beyond Egypt, scarabs have been found in various other Mediterranean countries and as far east as Iran, where they were in all probability taken by early traders. The Greeks and Etruscans copied the scarab in their own art, Etruscan scarabs of the 6th and 5th centuries B.C. being especially fine.

(a) (b) (c) (d)

(a) *Scarabeus sacer*, found only in the Eastern Hemisphere, is the species most commonly regarded by the ancient Egyptians as sacred; (b) small North American tumblebug, *Canthon laevis;* (c) common North American junebug, genus *Phyllophaga;* (d) the gold bug, *Plusiotis resplendens;* native to Central America, this scarab has the color and sheen of highly polished 24-carat gold. (All life size)

Among the Egyptian scarabs to be found in Hall 33, case J, of Field Museum are blue glaze amulets of the XXVIth-XXXth dynasties, winged scarabs of the XXIInd-XXXth dynasties, and heart scarabs from between the XVIIIth and XXVth dynasties.

Scarabs generally, that is to say, all members of the beetle family Scarabaeidae typically have oval or elongate bodies, a robust appearance, and are rather lethargic in habit. They

**DYNASTIDS—giants of the living scarabs**

THE ELEPHANT BEETLE *(Megasoma elephus)* occurs in Central and South America. (Life size)

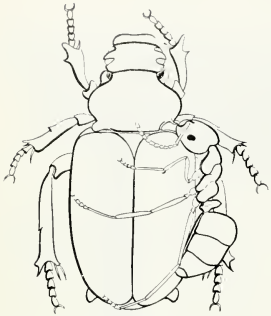
THE GOLIATH BEETLE *(Goliathus regius)*, found in Africa, is perhaps the largest of all living insects. (Life size)

THE HERCULES BEETLE *(Dynastes hercules)*, native to Central and South America, sometimes measures more than six inches to the tip of the horn. (Life size)

are distinguished from other beetles by the platelike, or lamellate, structure of the three end segments of the antennae. These may be opened and closed something like a fan. The family is further distinguished by a five-segmented tarsus—the end section of the leg. It may have been the total of these 30 segments on the sacred scarab's six legs that were believed by the ancient Egyptians to correspond to the 30 days of the month.

The family is of particular interest to the collector because it includes the giants of the beetle order: the goliath, hercules, elephant, and rhinoceros beetles—the so-called dynastids. The goliath beetle greatly outweighs the smallest mammals and may very well be, on the basis of weight, the largest of all living insects. Some dynastids have spectacular hornlike structures. As with many horned mammals, only the male dynastid bears horns.

Among the most curious, and least known, scarabs are beetles of the genus *Cremastocheilus*. These insects, ½ inch long or so, live in ant nests.



A worker ant gnaws at nutritive thoracic glands of the scarab *Cremastocheilus castaneae*. Apparently unharmed by this attention, the beetle is held captive in the nest or, in some cases, freely comes and goes. (Several times life size)

Some appear to be held captive; others apparently come and go with complete freedom. A nutritive fluid, eaten by the ants, is secreted by special glands located between the beetle's thorax and the wing covers. Clinging to the beetle's body, the ant gnaws at the glands to release the fluid.

**Scarab pests**

Many scarab species are serious pests of food crops, flower gardens, lawns, and golf greens. The junebug (a name applied to more than 100 closely related species, mostly of the genus *Phyllophaga*), is a destructive insect that occurs throughout North America; it is also known as the June beetle or May beetle. The peanut-shaped, shiny-brown adults—½-¾ inch long—feed at night on the foliage of trees and shrubs. Enough of these insects can strip a large plant of its leaves overnight. At the first light of dawn the junebugs descend to the ground. But at dusk they again take flight, seeking out a suitable tree or shrub for their evening meal.

The white-bodied, brown-headed junebug larvae—commonly called white grubs—grow to about an inch long. They live in the soil, burrowing as deep as five feet, and do serious damage to the roots of forage plants, lawn grass, and a large number of agricultural crops.

The rose chafer (*Macrodactylus subspinosus*), a widely distributed insect closely related to the junebug, is a tan, slender beetle about ½ inch long that feeds on the foliage and flowers of grapes and roses. Peaches and other fruits are also among the rose chafer's favorite foods. The rose chafer grub, like that of the junebug, does serious damage to a variety of food crops by eating the roots. Curiously, the rose chafer is poisonous to poultry, which sometimes die from eating the beetle. (The name "chafer," like *Käfer*, the German word for any sort of beetle, is derived from the name of the ancient Egyptian god *Khepera*.)

The Japanese beetle (*Popillia japonica*) is a beautifully colored scarab, but it is also a pest in many parts of the United States. It feeds on the foliage and fruit of at least 250 plant species, including cultivated fruit trees, shrubbery, and lawn grasses. The ½-inch-long metallic green or greenish bronze insect first arrived in this country in about 1916 as a stowaway on the roots of agricultural stock shipped from Japan.

**Tumblebugs and scavengers**

Beneficial scarabs include the dung beetles (which comprise many species and several subfamilies) and the skin beetles (family Troginae). Dung beetles remove the excrement of larger animals by burying and devouring it. Skin beetles—so-named because they commonly occur under the hides of dead animals—feed on carrion.

The sacred scarab, a dung beetle which occurs only in the Eastern Hemisphere, belongs to a subfamily (Scarabinae) whose members are also commonly called tumblebugs. These insects are fascinating to watch as they go about their task: When the tumblebug comes upon a piece of animal dung it cuts off a chunk, works it into a sphere often much larger than itself, then rolls it away. Sometimes two beetles cooperate at the task—one pulling, the other pushing. When the ball reaches a hole or crevice in the ground it is dropped in and one or more eggs (depending on the species) are laid in the ball. Later the ball is used as food by the developing grub. J. Henri Fabre's *The Sacred Beetle and Others*, first published in English in 1918, is a classic account of the activities of the dung beetle.

Two dung beetles, or tumblebugs, of the North American species *Canthon pilularis* work together to move their ball of dung to a hole or crevice in the earth.

Photo courtesy of John H. Gerard.

Hunting scene from cave at Ares del Maestre, Castellón.

# Spanish prehistoric art

By G. Henry Ottery

FOR FIVE-YEAR-OLD Maria, it was like a holiday. She was thrilled that her father, Marcelino de Sautoula, an engineer and amateur archaeologist, permitted her to explore with him the caves of the Cantabrian mountain region of northern Spain that day in 1879. There were so many caves, and Maria's father had told her that they had been home and refuge for succeeding generations of humans.

They were examining the interior of the Cave of Altamira. It was a very low cave, so that, while Maria was able to stand up, her father had to crawl or walk duck fashion. Maria's excited eyes darted to all sides and up and down, not knowing what to expect. Suddenly she cried out, "Papa! Los toros!" Her father's eyes followed her pointed finger to the roof of the cave until they found Maria's bulls. They were painted bison, whose rich colors must have astonished Marcelino, and humbled him with the message they brought from centuries past.

Maria and her father—and the world—had discovered the art of painting in one of its earliest stages. Since that day in 1879, more than 100 caves and rock shelters in northern Spain and southern France, as well as large numbers of rock shelters in eastern Spain, have been discovered to contain prehistoric paintings and engravings, dating as far back as 30,000 B.C.

A representative sampling of these art findings has been placed on view in Field Museum's Hall 27, and will remain through October. The exhibit "Spanish Prehistoric Art," is comprised of 42 photographs and other reproductions of cave paintings and engravings. Visitors to the display are reminded of the Museum's Hall of the Stone Age of the Old World, where full-size, three-dimensional dioramas recreate in detail two prehistoric rock shelters and a cave discovered in France, which present other examples of prehistoric art.

**Development of the art**

There were more skeptics than believers when the cave drawings were first discovered. Very few thought them to be genuine. In spite of the knowledge gained from the earlier study of numerous small works of art —objects of stone, bone, and horn adorned with incisions or reliefs—the date and authenticity of the paintings

Detail of cave painting from Ares del Maestre, Castellón, depicting bull and archer

were difficult to determine. Even the specialists in prehistory misinterpreted their significance, some saying that they could have been done by Roman soldiers, others declaring that the artists were Spanish priests! It wasn't until about 20 years after Maria's discovery, when similar paintings were found in caves in southern France, that the problem was solved.

These early paintings are of extraordinarily high quality and the artists have been favorably compared with the most renowned artists of historic times. The prehistoric artist had to invent techniques and overcome great difficulties. He had limited colors. He initiated the use of dotted outlines, the silhouette, flat colors, incised and relief sculpture, etc. Frequently the artist had to work by torch light or by the light of lamps made of hollow stone and filled with animal fat, since he often worked at a great distance from the cave's entrance.

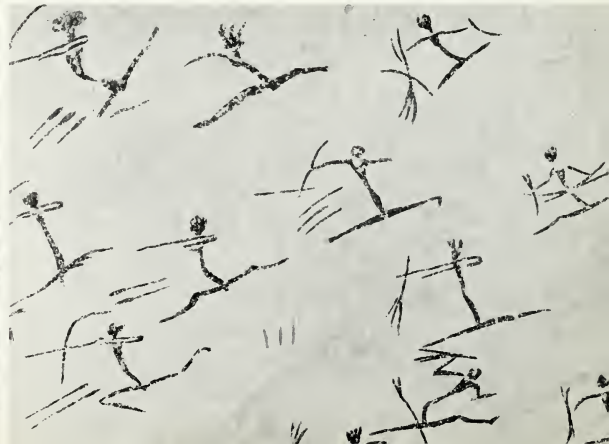
The paintings of these artists are thought by some to involve hunting magic or to relate to fertiliy rites. The figures are full of life. Animals abound. Painted hands appear on some cave walls; a masked human is also depicted. The appearance of symbols suggests the artists' capacity for abstraction. Authorities generally agree that these methods of artistic expression had their beginnings about 30,000 B.C. The paintings that Maria found are usually considered as part of the grandiose last chapter of late Paleolithic art, around 15,000 B.C.

After about 9,000 B.C. a second style of painting appears in prehistoric Spain. In addition to animal forms—still painted in a naturalistic style—a great number of human beings, of both sexes, appear. Those wearing what appear to be skirts are identified as women. But humans are depicted more in an abstract than in a naturalistic style. All figures are comparatively small, appearing especially in hunting or food gathering scenes. In addition, instead of adorning the hidden recesses of caves, this style of art is found on the walls of rock shelters in the mountains of eastern Spain. As this style worked its way westward, it lost its last traces of naturalism and became schematic and abstract. One reason for this change, it has been argued, could have been an evolution from the natural representation of the figure to the stylized figure and the symbol. Another reason may have been the introduction of a different style and different mentality, brought about by what has been termed the Neolithic Revolution. Some believe that both of these factors may have joined to create the new style.

These prehistoric paintings and their geographic limitation have caused constant problems for the archaeologist since their discovery in 1903. But the consensus is that they were painted between 9,000 and 3,000 B.C.

Although two subsequent periods of Spanish antiquity are also recognized in the development of prehistoric art, the Museum exhibit concerns itself with the first two periods, spanning 27,000 years. The display was assembled because of increasing interest in prehistoric and primitive art. The traveling exhibit was organized by the Spanish Institute, Inc. of New York.

Left: Male figures from cave painting at Monfrague, Cáceres. Right: Detail of battle scene from painting in rock shelter near Ares del Maestre, Castellón.



**The Archaeology of Arizona: A Study of the Southwest Region**

By Paul S. Martin and Fred Plog. New York: Natural History Press, 1973. 448 pp.; illustrations; end maps. $16.95.

The regional archaeological study that is both authoritative and well illustrated is unusual enough, but it is even more remarkable when this combination is as intellectually satisfying and innovative as the volume Martin and Plog have produced. They have succeeded in creating a stimulating exposition of archaeological problems in the Southwest through their comprehensive review of Arizona archaeology. The graphics have not been neglected in this visually attractive book, and the illustrations are informative and often pleasing to the eye.

The admirable aspect of this book is its scope. It is a carefully organized exposition of the kind of scientific problem orientation that the authors have participated in over the last dozen years. The new directions that Martin and others have charted find their way in the discussion of all aspects of Arizona archaeology. The organization of the book, which is much more than an introduction to Arizona archaeology, testifies to the broad scope of their study, whose range is represented by the eight parts of the book that encompass 21 chapters. These parts are: 1. Tools in Recovering Arizona Prehistory, 2. Environments of Arizona, 3. Space and Time Dimensions, 4. The Evolution of Subsistence-Settlement Systems, 5. The Evolution of Technology, 6. Changing Patterns of Social Organization, 7. The Great Events in Prehistoric Arizona, and 8. Southwestern Prehistory—An Explanation. Completely absent is the procrustean geographical and historical organization that has been the time-honored form of regional archaeological syntheses—including the two previous statewide studies in the series.

This book is not a catalog of fancy artifacts and picturesque ruins that could easily have been the focus of any Arizona archaeological text. Instead the authors have selectively used the prehistoric record to illustrate their exposition. They have chosen to communicate their thesis that the archaeology of Arizona has something of importance to contribute to our understanding of man's cultural evolution. This is not a didactic exercise, but is a serious study concerned with explaining the actual variety present in the archaeological record. In so doing they stress such explanatory relationships as the adaptive contexts of technologies, the patterns of site location that relate to the procurement and control of resources (energy), and the various cultural responses to different types of labor organizations. Theirs is a cultural and social study of Arizona archaeology. In the end they develop the notion that the past is continuous with the present and that explanations of past events must be conceptually acceptable to explaining contemporary cultural change. But as broad as the conceptual scope of their study is, they have kept their link with archaeological history by returning to recurring questions asked of the archaeological record: how did agriculture arise, why were the great towns established, and why were so many areas of former pueblo occupation abandoned?

The responsibility for each chapter was solely that of one of the authors, who also enlisted the assistance of David Gregory and Frederick Gorman in writing one chapter and the appendix. Because of this division of authorship there are redundancies and inconsistencies. But it is to the credit of the authors that these are so few. The appendix included is a useful guide to the ruins since it is an alphabetical list of dated sites with locations and brief descriptions. Unfortunately, the book lacks a glossary and the index is quite skimpy.

There is an importance to this book beyond that of a masterful statement of what Arizona archaeology is about. It represents the capstone statement of the kind of archaeology that Paul Martin of Field Museum and his students have been involved in during the last decade. He has been a pioneer in charting and actively supporting new directions in research into Arizona's past. It is his field station at Vernon, Arizona, that has been a major instrument in developing the models and tools for implementing the approach represented in this book.

This volume is highly recommended to the serious reader with some acquaintance with southwestern archaeology. It is unparalleled in its breadth and regional comprehensiveness, and its organization permits many uses, including a field guide, a scientific text and as a source for finding answers to questions about Arizona's past.

*by James A. Brown,*
*Department of Anthropology,*
*Northwestern University.*

## Fieldiana Publication Describes New Order of Fossil Fishes

Dr. Rainer Zangerl, chairman, Department of Geology, has recently co-authored with Gerard R. Case a major work in which an entirely new group of Pennsylvanian fishes is described. "Iniopterygia, a New Order of Chondrichthyan Fishes From the Pennsylvanian of North America" (*Fieldiana: Geology Memoirs*, Volume 6) provides a characterization of a new order of vertebrates —Iniopterygia, as well as descriptions of five genera and seven species never before recorded. The iniopterygians are known only from carbonaceous, sheety shales of the Pennsylvanian basin complex of central North America.

As the authors point out in their closing paragraph, "the fact that it is still possible to discover whole groups of vertebrates that have escaped our notice should once again focus attention on the probability that the fossil record is far from adequately known."

# Ray A. Kroc Environmental Education Program

A film series, field trips, and children's workshops will be offered to the public, beginning October 12, as the first Ray A. Kroc Environmental Education Program gets underway.

In announcing the new program, Museum Director E. Leland Webber pointed out that it is being made possible by the Ray A. Kroc Environmental Fund. The fund was recently established at Field Museum by his friends to honor Mr. Kroc, chairman of McDonald's Corporation, on his seventieth birthday.

Other events of this new program will be presented in coming months and years.

Organizing the various components of the program is Carolyn Blackmon, Coordinator of special educational services for the Museum.

"We are extremely grateful that we have funds available to begin a quality program on the environment," she said. "We feel confident that this broad program will contribute in an important way to an understanding of the wide variety of environmental problems that affect the quality of our lives."

Assisting Mrs. Blackmon was a committee that included, besides herself, Matthew Nitecki, associate curator of fossil invertebrates; William Burger, associate curator of vascular plants; Loren P. Woods, curator of fishes; Alice Carnes, coordinator of teacher training, Department of Education; and James Bland, lecturer, Department of Education.

**Film Series**

Each film will be presented twice—Fridays at 7:30 p.m. and Saturdays at 10:30 a.m.—in the Lecture Hall. Critical evaluations will be invited. Seating limited to the first 225 persons for each showing. Admission free. Field Museum is open 9 a.m. to 9 p.m. on Fridays; thus affording an opportunity for a late afternoon visit to the Museum followed by the film program.

Oct. 12 and 13—Double feature. "The Sun Serves Niger," narrated by Alistair Cooke, portrays efforts by scientists to perfect solar energy facilities on the Sahara Desert. "Slow Death of the Desert Water"—from the TV series "Our Vanishing Wildlife"—shows how the desert fish cui-cui, found nowhere else in the world, faces extinction as Pyramid Lake in Nevada dries up.

Oct. 19 and 20—"Mzima: Portrait of a Spring" describes this spring in Kenya as a fascinating ecosystem that demonstrates the interdependence of animals.

Oct. 26 and 27—"Billion Dollar Marsh," filmed by the BBC at Sapelo Island, Georgia, examines a saltwater marsh and coastal dunes from New Jersey to Florida.

Nov. 2 and 3—"Should Oceans Meet?" is a question posed during the construction of a sea-level canal that would allow Atlantic and Pacific waters to merge for the first time in millions of years, presenting a potential ecological program. "Of Broccoli and Pelicans and Celery and Seals." The ecological effect of pesticides sprayed on the Oxnard Plain in California.

Nov. 9 and 10—"Death of a Legend," produced by the National Film Board of Canada, recounts the life story of the wolf, including its struggle to survive man's predation.

Nov. 16 and 17—Double feature. "Prairie Killers," produced for National Education Television (NET), depicts the prairie dog as a vital part of the chain of life on the Great Plains, and explains the consequences of removing this link in the chain. "Tragedy of the Commons," based on an essay by Garrett Hardin, is an exploration of the effects of overpopulation on the resources of a finite earth.

**Field Trips**

Busses will depart Field Museum at 9:45 a.m. for each field trip. Each trip is limited to 40 adults. A $4 fee will be charged to cover lunch and transportation. Checks, made out to Field Museum, together with name(s), address, telephone number, and choice of field trip should be mailed to: Mrs. Carolyn Blackmon, Coordinator of Special Educational Services, at Field Museum. For further information, dial 922-9410, ext. 361 or 363.

Oct. 13—"Keeping Waters Blue," the first field trip, will be led by Loren Woods, curator of fishes. Participants will observe the inshore ecology of Lake Michigan via a Skyline boat cruise (included in fee), followed by a visit to the Chicago water purification plant to view its operations.

Oct. 20—"Ancient Chicago Environments." Led by Dr. Eugene Richardson, curator of fossil invertebrates, the group will see 300,000,000 years of the earth's history, as recorded in strip mine Pit 11 in South Wilmington. A visit to a recreation site on reclaimed land will follow.

Oct. 27—"History in the Sand; Futures in Energy." Led by Harry Changnon, assistant to the chairman of the Department of Exhibition, participants will tour Illinois Beach State Park, the Zion Atomic Energy Plant, and the Waukegan Thermal Plant.

Nov. 3—"Maintaining a City within a City" is the challenge of the John Hancock Center. How it's done will become apparent to the group as it examines the life-support system of this miniature urban ecosystem. A tour of the Chicago Sanitary District concludes the day's outing, which will be led by Dr. William Burger, associate curator of vascular plants.

**Workshops for Young People**

Two different, single-session workshops will be presented on Saturday, beginning Oct. 20, and repeated on Oct. 27, Nov. 3, 10, and 17. Offered free, they will be led by James A. Bland of the Museum's Department of Education. Since each session is limited to a specified number of participants, reservations are mandatory. For reservations or further information, phone 922-9410, ext. 361 or 363.

10:00 a.m.—"Mini-Environments." Students (ages 9-13) will construct their own mini-environments to be taken home with them. The workshop will include a discussion on the care and upkeep of these environments. Limited to 20 students per session. In the Meeting Room.

1:00 p.m.—"Ballad of a Disappearing Legacy: Demise of the Wolf." The anatomy, behavior, and role in nature of this endangered animal will be discussed, as well as the characteristics of other endangered species. Limited to 50 students (ages 12-17) per session. In the Lecture Hall.

The Fall Saturday Children's Workshops, sponsored by the Museum's Department of Education, afford children an opportunity to meet with staff members and to work with specimens from the Museum's scientific collections. These workshops provide instruction in small groups and participation in a variety of topics and activities that appeal to children of different age groups This popular fall activity for children was originated ten years ago by the Raymond Foundation to stimulate interest in natural history and to encourage use of the Museum as a learning resource.

To ensure a close working relationship between the child and the Museum staff teacher, registration for each workshop is necessarily restricted. However, in order to accommodate as many children as possible, two sessions are scheduled each Saturday, at 9:30 and 11:00 a.m. Each lasts about one hour.

Make reservations now. Each applicant is limited to one program; reservations will be accepted in the order in which they are received. If more than one child in your family wishes to attend a workshop, please submit a separate application for each child. Accepted applicants will be sent a confirmation card that will admit them to the workshops.

**Insect Life**

Oct. 13—Julie Castrop, leader; ages 8-10

The structure, growth, and behavior of insects will be demonstrated with specimens and other illustrative materials. Children will then take part in an insect "scavenger hunt" in the exhibit halls. (Each session limited to 24 students.)

NOTE: Telephone reservations *for this workshop only* may be made by calling the Raymond Foundation at 922-9410.

**Tooth for Tooth**

Oct. 20—Martha Lussenhop, leader; ages 8-10

Through observation and study of skulls and jaws, children will determine how the size and shape of animal teeth indicate function and diet. Game-like activities will implement this study. (Limited to 24 students.)

**African Folktales in Pantomime**

Oct. 27--Edith Fleming, leader; ages 8-10

Following a close examination of African mammals—especially horns, body postures, and coat markings—participants will dramatize an African folktale by impersonating these animals. (Limited to 20 students.)

**Toys and Games of North American Indians**

Nov. 3—Harriet Smith, leader; ages 8-10

Children will handle the playthings of Indian boys and girls. By determining how they were used and what they were made of, participants will decide the physical environment and ways of life of the Indian children to whom the toys belonged. (Limited to 24 students.)

**Fossils in the Floor**

Nov. 10—Martha Lussenhop, leader; ages 9-12

Many invertebrate fossils may be seen in the marble floor and south stairway in Stanley Field Hall. After becoming familiar with how fossils are formed and how they appear when cut into sections, children will search for fossils in the floor. From sketches they make, the group will try to identify these fossils in Museum exhibits. (Limited to 24 students.)

**Chinese Brush Painting**

Nov. 17—Edith Fleming, leader; ages 9-13

After carefully examining selected Chinese paintings and scrolls on display in the Museum, boys and girls will have an opportunity to practice Chinese brush techniques. (Limited to 20 students.)

**Southwestern Designs**

Nov. 24—Harriet Smith, leader; ages 11-15

Decorations on masks, pottery, baskets, and weaving will be compared to discover those aspects of desert environment that most influence the lives of Southwestern Indian tribes. (Limited to 24 students.)

**Microscopes**

Dec. 1—Julie Castrop, leader; ages 11-13

Participants will work with a microscope to learn how it works and how it is used. After observing prepared slides, boys and girls will learn how to make their own slides using a variety of biological materials and commonplace objects. (Limited to 24 students.)

Cut out and mail to: Raymond Foundation, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605.

**Application for Fall Workshops**

Program desired

_____ *1st choice*

_____ *2no choice*

_____ *3rd choice*

_____ *4th choice*

*Time (circle preference) 9:30 a.m. 11.00 a.m.*

_____ *Name of child*

_____ *Address*

_____

_____ *Age of child*

_____ *Membership in name of*

# FIELD BRIEFS

## Seek Volunteer Teachers

A volunteer teacher training course is being offered to a limited number of adults by the Museum's Department of Education, beginning October 11. Volunteers are needed to assist the Museum staff in providing expanded educational programs for the thousands of school children who visit the Museum each year. The course will include natural history subject matter, the techniques of teaching with the aid of Museum exhibits, specimens, and artifacts, and the use of audiovisual equipment. Instruction will be given by members of the Department of Education.

Applicants will be selected on the basis of experience, availability, and a personal interview. The first session will be an orientation on October 11 at 10:00 a.m. The course will continue for ten successive Thursdays from 10:00 a.m. to 3:00 p.m. Individuals who are curious about the world around them, who enjoy working with children, and who can give one day a week to the Museum's teaching program are invited to arange for a personal interview with Carolyn Blackmon, coordinator of special educational services, Department of Education, at 922-9410, ext. 361.

## Actress Sandy Dennis Visits Field Museum

Actress Sandy Dennis (rt.), recipient of Academy and Tony awards, and her husband, jazz saxophonist Gerry Mulligan, sneak-previewed the forthcoming Contemporary African Arts exhibit during a recent visit. Maude Wahlman, consultant in African ethnology, and Sandy helped Gerry prepare to play an instrument from Kenya, made of sable antelope horn, beeswax, and gourds. The exhibit opens next spring. Photo by Herta Newton.

## Community Outreach Program

Among children who studied pottery-making techniques at Field Museum this summer were (from left) Linda Rainwater and Sandra Swinney; Hull House counselor Elaine Goings stands behind them. Photo by John Bayalis, Jr.

The children shown above were participants in a program offered through August 30 to neighborhood organizations on a pre-registered basis. Geared to children ages nine through teens, it included workshops in weaving with yarn, glass beadwork, pottery, and animated film-making.

The two-session classes, which also included a tour, were planned to help children see the relationships between art forms and designs in various cultures, and to understand their meanings within a particular culture. Each child was also encouraged to express his own feelings about their art forms by creating his own designs and completing a craft project.

The workshops were sponsored by Field Museum's Department of Education under its Community Outreach Program, funded by the National Endowment for the Arts and the Illinois Arts Council.

## Frank Hull Named Chief Accountant

Field Museum's new chief of the accounting department is Frank M. Hull, formerly business manager for St. Francis College in Joliet, Ill. Prior to that he had held positions with Millikan University, in Decatur Ill., and with the Illinois Power Company. A native of Decatur, Mr. Hull is a graduate of Millikan University and of the American Council on Education's Institute for College and University Administrators. He has also done graduate work at Northern Illinois University.

## Gerald Durrell Gives Lecture

The noted author and conservationist Gerald Durrell will give an illustrated lecture on conservation in James Simpson Theatre of Field Museum on Thursday, Oct. 18, at 8 p.m. The lecture is to be sponsored by SAFE (Save Animals From Extinction). Members of Field Museum, the Chicago Zoological Society, and SAFE will donate $1.00 for admission; donation for nonmembers will be $1.50. All proceeds of the lecture will go to support conservation programs of SAFE. Entrance will be by the Museum's west door only; free parking available at the west and north parking lots. For further information call 922-9410, ext. 361 or 363.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I certify that the statements made by me above are correct and complete.—*Norman W. Nelson, Asst. Dir., Admin.*


# CALENDAR

## Exhibits

Closes October 31

**Spanish Prehistoric Art,** an exhibit of about 40 drawings and photographs of paintings found in caves and rock shelters. The collection is being shown through the courtesy of the Spanish National Tourist Office. Closes Oct. 31. Hall 27.

Continuing

**Field Museum's Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past, and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Film Program

**Ayer Adult Film Lecture Series,** offered at 2:30 p.m. Saturdays in the James Simpson Theatre. The October 20 program will also be presented at 7:30 p.m. Friday, October 19.

October 6: **"In the Heel of the Northeast Trade,"** (Palau Islands, Micronesia), narrated by Dr. Kenneth R. H. Read.

October 13: **"Hawaii,"** narrated by Doug Jones.

October 19 and
October 20: **"The Epic Voyages of Ra,"** narrated by Comdr. Norman Baker.

October 27: **"Minnesota Valley Saga,"** narrated by Dr. Walter J. Breckenridge.

## Special Events

**Ray A. Kroc Environmental Education Program,** a series of films, field trips, and children's workshops. (See p. 16.)

## Children's Program

Continuing

**Fall Journey for Children,** "Plant Your Dinner," a free self-guided tour of Museum exhibit areas. The journey not only acquaints youngsters with botanical displays, but encourages them to learn more about plants by growing their own live specimens at home. All boys and girls who can read and write may join in the activity. Journey sheets available at entrances. Through November 30.

## Coming in November

**Ayer Adult Film Lecture Series,** offered at 2:30 p.m. Saturdays in the James Simpson Theatre. The November 17 program will also be presented at 7:30 p.m. Friday, November 16.

November 3: **"New Hebrides,"** narrated by Kal Muller.

November 10: **"Panama,"** narrated by Col. John Craig.

November 16 and November 17: **"China: The Awakening Giant,"** narrated by Jens Bjerre.

November 24: **"Indonesia,"** narrated by Dr. John Nicholls Booth.

Join us for coffee after the Friday evening film lecture presentations and meet speakers Comdr. Norman Baker on October 19 and Jens Bjerre on November 16.

## Meetings

October 9: 7:30 p.m., Nature Camera Club of Chicago.

October 10: 7 p.m., Chicago Ornithological Society.

October 10: 7:30 p.m. Windy City Grotto National Speleological Society.

October 11: 8 p.m., Chicago Mountaineering Club.

October 23: 7:30 p.m., Nature Camera Club of Chicago

## Hours

9 a.m. to 5 p.m. Saturday through Thursday, and 9 a.m. to 9 p.m. Friday.

The Museum Library is open 9 a.m. to 4:30 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

Museum telephone: 922-9410

Volume 44, Number 10
November 1973

# Field Museum of Natural History Bulletin

**Field Museum of Natural History Bulletin**

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November 1973

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## contents

**CAN THESE BIRDS SURVIVE?** 3
Endangered species of North American birds and their current status
By David M. Wa'sten

**THE CHICAGO RIVER SYSTEM** 9
—moving towards recovery
By Joyce Marshall Brukoff

**SNUFF BOTTLES** 16
A "classification extraordinaire"
By Alice K. Schneider

**FIELD BRIEFS** 20

**CAPITAL CAMPAIGN** 22

**CALENDAR** 23

cover

The bald eagle, *Haliaeetus leucocephalus*, selected in 1782 as the United States' national emblem, is today considered an endangered species. Although it still ranges widely over North America, the bird has disappeared from areas where it was once abundant. If the bald eagle's recent rate of decline continues it could soon become extinct.

The cost of this enlarged issue of the Field Museum of Natural History Bulletin, which stresses important environmental issues, was in part underwritten by the Ray A. Kroc Environmental Fund.

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Brown Pelican
*Pelecanus occidentalis*
length: 41″

# Can These Birds Survive?

By David M. Walsten

Residents of many southern coastal areas would be surprised and perhaps puzzled to learn that the brown pelican, so familiar to them, has been classified by the U.S. Fish and Wildlife Service as an "endangered" species.

John Henry Dick from National Audubon Society

Bachman's Warbler
*Vermivora bachmanii*
length 4¼"

Contrary to popular belief, "endangered" does not necessarily mean "rare"; an endangered species may be so classified if the general population has declined at such a rate that the species appears to be in danger of extinction. Thus, in some areas, an endangered species may actually be common and, to all appearances, thriving. The requirements for survival may vary greatly from one species of bird to another. Some, like the bald eagle and whooping crane, cannot tolerate the presence of man. Some, like the recently extinct passenger pigeon, apparently cannot perpetuate themselves except in concentrated numbers. Still others, like the Everglade kite, subsist on highly specialized diets that may be easily upset by human disruption of the habitat.

The species described on the following pages are currently listed as endangered by the U.S. Fish and Wildlife Service or by the International Union for Conservation of Nature and Natural Resources, Switzerland.

**The brown pelican** *(Pelecanus occidentalis)* was once a common sight along most coastal waters of the United States; it also ranged southward along the coasts of northern South America. Following the advent of DDT, however, pelican populations dropped drastically in some areas, notably in Louisiana and Lower California. Only since the dangers of DDT were recognized and its use curtailed, has there been a population stabilization or noticeable increase in numbers. Pelicans reintroduced into Louisiana in 1968 appear to be breeding successfully. (DDT, like other pesticides consisting of chlorinated hydrocarbons, has been shown to reduce the fertility of animals at certain levels of concentration in their tissues. For further discussion of the pesticide problem see "The Vanishing Peregrine," by Melvin A. Traylor, in the *Bulletin*, Sept. 1970.)

**Kirtland's, or the jack pine, warbler** *(Dendroica kirtlandii)* has long been a rare species. Although as recently as 1958 James C. Greenway in his *Extinct and Vanishing Birds of the World* observed that the bird was "in no great danger of extinction," a precipitous decline in the populations of this bird has occurred during the past decade.

The nesting ground of Kirtland's warbler —which winters in the Bahamas—is confined to north central Michigan. Only 200 pairs were observed there in a 1971 spring survey, a decline of 60 percent from that of a decade earlier. Reasons for its decline are believed to be loss of acceptable nesting habitat and parasitism by the brown-headed cowbird. The cowbird lays its eggs in the nest of the warbler (among other species). Warbler fledglings, being smaller than young cowbirds, are unable to compete with them for the attentions of the adults at feeding time. As a result, they starve to death. A cowbird-trapping program is now underway in Michigan under the sponsorship of the Michigan Department of Natural Resources, the Michigan Audubon Society, and the U.S. Forest Service.

Kirtland's Warbler, *Dendroica kirtlandii*, length: 4¾"

G. Ronald Austing from National Audubon Society

Bachman's warbler *(Vermivora bachmanii)* has the unique trait of disappearing unpredictably from accustomed breeding areas. At one time the bird apparently vanished from South Carolina, only to show up there again some years later. It has continued to nest in that state for the past 35 years. The warbler also nests in Kentucky, Alabama, and Missouri, but its occurrence anywhere is rare. The bird prefers moist, deciduous forests, sharing the same general habitat as the common hooded warbler *(Wilsonia citrina)*, which it closely resembles. The winters are spent in Cuba. Ornithologists are unable to account for the rarity of this species.

The California condor *(Gymnogyps californianus)*, the largest North American land bird, has the most restricted range of any bird of prey, being found only in rugged mountainous regions of southern California. Its current population is thought to be less than 100—about the same as that of 15 years ago. In 1968-72 only four young were known to have been reared. No California condors have been bred or raised in captivity; however, Andean condors have bred successfully in the San Diego Zoo. In the early 1800s the California condor ranged as far north as the Columbia River; fossil remains have also been discovered in eastern North America. Some authorities attribute the bird's decline to a general decline in the food supply or to the bird's basic need for isolation from man in order to breed. A condor sanctuary has been established in Los Padres National Forest, where most of the nesting sites are located.

The ivory-billed woodpecker *(Campephilus principalis principalis)*, the largest North American woodpecker, may well become our next extinct bird.

California Condor
*Gymnogyps californianus*
length: 45"

Carl B. Koford from National Audubon Society

Ivory-Billed Woodpecker
*Campephilus principalis*
length: 18"

The last sightings occurred in deep forests of South Carolina, Florida, Louisiana, and Texas. Within historic times the ivory-bill ranged as far north as Illinois, Indiana, and Ohio. Early in the 19th century Audubon noted "entire belts of Indian chiefs ornamented with the tufts and bills of the species." Simultaneous with its disappearance in the United States, the bird has also become rare—or extinct—in Cuba (subspecies *Campephilus principalis bairdii*). The gradual destruction of the ivory-bill's habitat—very large trees with their specialized fauna of wood-boring insects—is held responsible for the bird's decline. The U.S. ivory-bill population dropped most radically between 1885 and 1900 when the logging industry in the south was rapidly expanding.

The whooping crane *(Grus americana)* has come within a hair's breadth of extinction; thanks to the efforts of conservationists, however, the bird has made a comeback. In the mid-1950s barely two dozen whooping cranes were thought to survive. The population of wild birds is currently more than 50 and the number of captive cranes about 20. At the present time, nesting areas are believed to be confined to Wood Buffalo National Park, in the

Whooping Crane
*Grus americana*
length: 45"
(immature at left)

District of Mackenzie, Northwest Territories, Canada. The wintering ground is confined to the Texas coast, primarily in Aransas National Wildlife Refuge. In 1811 the naturalist Thomas Nuttall described the whooping crane's migratory flight up the Mississippi: ". . . the bustle of their great migrations and the passage of their mighty armies fills the mind with wonder." But this graceful, regal bird is also shy; it withdrew from its natural haunts as civilization advanced, preferring, it seems, self-obliteration to sharing its territory with an alien creature, man.

An excellent, recent study of the whooping crane is to be found in *Cranes of the World* by Lawrence H. Walkinshaw; Winchester Press (1973).

The Florida sandhill crane *(Grus canadensis pratensis)*, one of the six subspecies, nests only in Florida and Georgia. Its home range is the coastal lowlands. Within the past century it may also have nested in Louisiana. Like the ivory-billed woodpecker, the Florida sandhill crane was seriously affected by lumbering activities in the late 19th century. Unless a refuge is established, it is feared that the bird will ultimately be driven to extinction.

The Aleutian Canada goose *(Branta canadensis leucopareia)* is now found on only two islands of the Aleutian group—Amchitka and Buldir. Overhunting along their migration route (to California) and introduction of the blue fox to their nesting areas are thought to be the cause of their decline; significantly, the blue fox does not occur on Buldir, the only island where the bird is known to breed. In 1966 the estimated total goose population was down to 250. Several pair of these geese are in captivity at Monte Vista, Colorado. Since their breeding potential in captivity is considered good, there is hope that the subspecies can be saved from extinction.

The masked bobwhite quail *(Colinus virginianus ridgwayi)*, once common in southwestern United States and Mexico, has been reduced to extreme rarity by overhunting and by the inroads of cattle grazing on its grassland habitat. About 1910 the bird disappeared from the northwest part of its range—the mountainous region of southern Arizona. Because these birds typically bunch together in coveys of 15 or 20, several in such a group could be killed with a single shotgun blast. A program for restoration of suitable habitat is currently being conducted by the Arizona-Sonora Desert Museum, assisted by the Allegheny Foundation of Pittsburgh.

Attwater's greater prairie chicken *(Tympanuchus cupido attwateri)*, a close

Aleutian Canada Goose
*Branta canadensis leucopareia*
length: 24"-26"

A. W. Ambler from National Audubon Society

Masked Bobwhite
*Colinus virginianus ridgwayi*
length: 8"

R. Van Nostrand from National Audubon Society

Bald Eagle
*Haliaeetus leucocephalus*
length: 32"

relative of the heath hen *(T. cupido cupido)*, which became extinct in 1932, is today found only in southwestern Louisiana, in isolated flocks along the Texas coast, and northward to Austin. In former times it occurred from southwestern Louisiana almost continuously to the Mexican border. In 1937 conservationists estimated that 8,000-9,000 of the species survived; in 1965 the number had dropped to 750. The primary reason for the bird's decline is the destruction of its grassland habitat by cattle.

The bald eagle *(Haliaeetus leucocephalus)*, sometimes called the American eagle, was still common in the United States when it was chosen as the national emblem in 1782. In Alaska the bald eagle was once so common that, in 1917, a bounty was placed on them there. Within a decade bounties had been paid on nearly 42,000 of the birds. In 1962 it was estimated that little more than 3,800 still survived in continental United States, Alaska excepted. Today the bald eagle continues to range over most of the continent, but localities where they are common are few and far between. The bird's decline is attributed to a lowered fertility—the effect of DDT and other chlorinated hydrocarbons and to the bird's natural preference for isolation from man.

The Everglade kite *(Rostrhamus sociabilis plumbeus)* has been the victim of marsh-draining and reclamation of land. Its primary range is the southwestern sector of Lake Okeechobee in Florida. At the turn of the century this kite was common, but by the late 1920s it had already become scarce. The kite's principal food is the great marsh snail *(Ampullaria depressa)*. The bird's continued survival rests on whether sufficient marshland is left to maintain this specialized food supply.

The American peregrine falcon *(Falco peregrinus anatum)*, which breeds from Lower California northward to non-Arctic Alaska and Canada, has disappeared from the eastern part of North America. The main reason for its decline is breeding failure, due to the cumulative effects of DDT. A considerable number of these birds are in zoos or are held by falconers; their breeding potential in captivity is considered poor, however.

Suggested additional readings:

*Extinct and Vanishing Birds of the World* by James C. Greenway, Jr.; Special Publication No. 13, American Committee for International Wild Life Protection (1958)

*Peregrine Falcon Populations*, Joseph J. Hickey, ed.; University of Wisconsin Press (1969)

*Red Data Book*, Vol 2: Aves, compiled by Jack Vincent; International Union for Conservation of Nature and Natural Resources (1966, with updating supplements)

American Peregrine Falcon
*Falco peregrinus anatum*
length: 15"

Reproduced from *Birds of Prey of the World* by Mary L. Grossman and John Hamlet (1964) Clarkson N. Potter publisher.

Chicago River Scene
*watercolor by Antimo Beneduce, A.W.S*

# *THE CHICAGO RIVER SYSTEM*

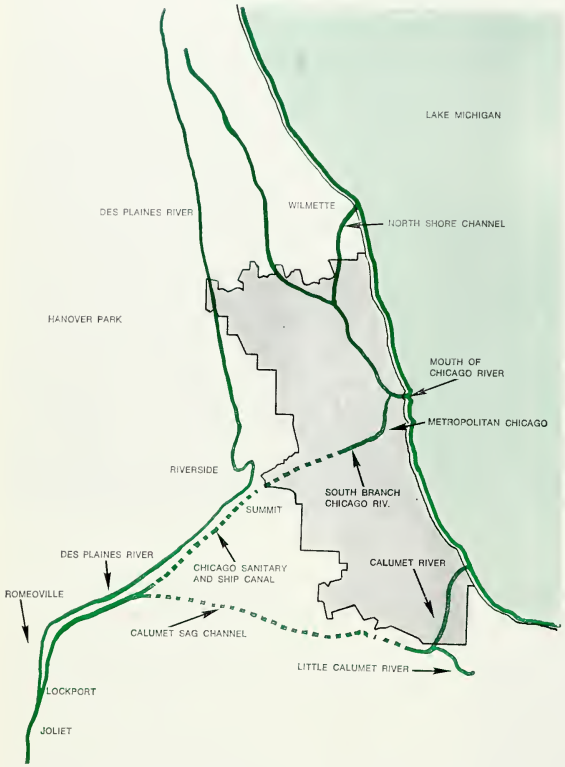
## *Moving towards Recovery*

By Joyce Marshall Brukoff

Few Chicagoans could envision their river as a Venetian-type canal, flanked by homes and shops, pavilions, and grassy parkland. Yet, that is what has been envisioned as a workable future solution to the river's present cesspool status. The plan is dependent on many factors: public interest, financial support, the cooperation of civic authority, and the fruition of the Metropolitan Sanitary District's current program to clean up the river. Conceived as a public service by Chicago architects Holabird & Root, the plan was presented over a year ago, and portions of it were adopted into the new Central Area Plan for Chicago, recently announced by the Mayor's Office.

*Joyce Marshall Brukoff is a Chicago writer.*

About 160 years ago, when Chicago was only a frontier settlement, the river and surrounding lands were alive in all seasons, rich in color and teeming with wildlife. There were muskrat and mink, ducks and wading birds, fish and turtles galore. Today, the fish do well to breathe, the muskrats and mink have been replaced by cement, rotting timber, and trash; most of the birds have retreated, and the debris-laden river itself flows sluggishly past warehouses, trucking stations, and the




tedious gray of industrial areas. Except for a few sections, the river has been shut away and walled up as one would throw old shoes into a closet—its potential as an aesthetic and functional resource largely ignored.
Fortunately, however, some environment-conscious groups have continued to militate against this river blight, and have variously dedicated themselves to a rebirth of the river as a life supportive, clean, and pleasant waterway which could serve as a vibrant artery through the heart of the city. With improvement of water quality and development of lands adjacent to the river, such as envisioned by the new Central Area Plan for Chicago, views of water would be common from streets as well as buildings and there would be greater public access to the river's edge.

Chicago was incorporated as a village in 1833; from then until 1855 the town had no sewers. In 1856 sewers discharging into the river were first constructed, and so they were until 1889. Other sewers combined to discharge directly into Lake Michigan. The city's water supply became grossly polluted and the death rate from typhoid and other water-borne diseases was alarmingly high.

To correct this health hazard, Chicago authorities accepted a proposal to reverse the flow of the South Branch of the Chicago River and divert it into the Mississippi valley. This was accomplished by the construction of the Sanitary and Ship Canal, begun in 1892 and completed in 1900. To understand why this making "rivers run backwards" was feasible, one must consider the unique natural features which distinguish the Chicago area and have contributed to its phenomenal growth.

Lake Michigan is the most noticeable of these features, providing a seemingly inexaustible supply of fresh water and a highway for water-borne commerce. But of equal importance is the broad, remarkably flat Chicago plain that was the bed of Lake Chicago —the glacial ancestor of Lake Michigan. When its swamps and wet prairies were drained, the plain became ideal for industrial, commercial, and residential developments.

The feature with greatest bearing on the river's reversal is the low continental divide between the watershed of the Chicago and the Calumet river systems on the one hand and that of the Des Plaines River on the other. This divide is between the St. Lawrence and the Mississippi; and northeast of Summit it is only 15 feet above the level of Lake Michigan. The canal was constructed through that divide, utilizing yet another natural feature of Chicago, the Des Plaines River.

The Des Plaines is a placid stream, originating from swamplands in Kenosha and Racine counties in Wisconsin. It meanders southward through a flat valley roughly parallel to the shore of Lake Michigan. Below River Grove, the Des Plaines flows southward—except for two hairpin turns at Riverside—across the Chicago plain, until, near Summit, it turns southwest into a deep valley. When the last glacier melted away, mighty torrents from Lake Michigan poured through that valley, and through the Sag valley which joins it at Sag Bridge. That is the Chicago Outlet, one of the five great "keys to the continent": the best natural pass to the Mississippi valley.

From Lyons to Romeoville the Des Plaines river flows southwest in a diversion channel, constructed with a levee to keep it from overflowing into the Sanitary and Ship canal, parallel to it. Between Romeoville and Joliet the river drops 80 feet; at Joliet it joins the canal. At Rockdale, south of Joliet, the canal ends and the Des Plaines, widened and deepened as part of the Illinois Deep Waterway, continues southwest until it joins with the Kankakee to form the Illinois River.

The pollution problem which preceded the construction of the canal was heightened by flooding and high water after storms, a problem still besetting the area today. East of Chicago's Harlem Avenue (7200 west), there was a swamp called Mud Lake. That was the scene of occasional flooding when the Des Plaines River would pour eastward over the low continental divide, through Mud Lake and the South Branch of the Chicago River, into Lake Michigan. One of these floods, in 1885, swept so much sewage into the lake that the city's water supply became unusually polluted and a great many deaths resulted.

Shortly after that, the Sanitary District of Chicago was established and, in 1892, construction actually began on the Sanitary and Ship Canal from the South Branch, near Damen Avenue (2000 west), to Lockport—28 miles distant. Much of this construction was through solid rock—the sill that underlies the continental divide.

The main channel of the canal reversed the flow of the South Branch of the Chicago River and diverted it into the Mississippi Valley. Through a navigation lock and control gates at the mouth of the Chicago River, the canal is flushed with fresh water from Lake Michigan. The North Shore Channel, through gates at Wilmette, diverts fresh water into the North Branch. The Calumet-Sag Channel, completed in 1922, reversed the flow of the Calumet and Little Calumet rivers and discharges their waters into the main channel. In 1907 interceptor sewers were completed, protecting Lake Michigan from contamination.

But it wasn't enough. In 1919, an ordinance was passed by the District Board of Trustees committing the district to the construction and operation of sewage treatment plants These plants were constructed between 1922 and 1939, the three principal plants being the Calumet, North Side (in Skokie), and West-Southwest (in Stickney). They now operate both primary and secondary treatment processes, with tertiary treatment planned, to be completed in the mid-1970s.

Primary treatment removes 35-40 percent of suspended solids and biological oxygen demand. Secondary treatment is 90 percent effective and tertiary treatment leaves the water as much as 99 percent pure. It is definitely planned to update and enlarge these treatment plants to meet these higher standards and to handle additional water. Some small tertiary treatment plants are either under construction or have been already installed. The first one to be completed, at Hanover Park, was placed in operation in 1968.

*Chicago's floating junkyard—a typical scene along the river's edge.*

Courtesy Chicago Tribune

But there are many other plans to clean up the river. In-stream aeration will soon be in process. This method of renewing life in the river depends on the release of oxygen to channels and streams to help raise the dissolved oxygen content to 5 parts per million, the amount necessary to support high quality fish life. In-stream aeration is done by blowing air or oxygen into the water from submerged pipes or by churning the water.

A major future development will be the Chicago Tunnel and Reservoir System, scheduled for completion by 1983 at a cost of more than $1 billion. This plan deals with the problems of waterway flooding and pollution control and with combined sewer spillage. Chicago has an unusual sewer system. It combines household, industrial, and commercial wastes with storm water. At the present time, overflow points in the sewer system are released directly into the waterways. Peak runoff rates from the combined sewer-drainage areas have greatly increased, overloading the flow capacity of the open watercourses, including the Sanitary and Ship Canal.

The result is a necessary reversal of flow in high storm-water runoff. The surcharge of polluted backflow is released into Lake Michigan from the North Shore Channel, the Chicago River, and the Calumet River. As these backflows occur with increasing frequency, the area is back to the problem that plagued it a century ago pollution of Lake Michigan and the rivers—but to this problem there is fortunately a solution.

The new tunnel and reservoir system will capture combined sewer flows, conveying them through high velocity, underflow tunnels (out of sight) below the routes of the existing surface waterways. They will be held in huge pit-type detention reservoirs until post-storm periods. The stored water will then be pumped into the treatment plants. This will require, by the way, expansion of the existing treatment facilities.

*Engraving from an early daguerrotype showing damage from 1849 flood. Boats are scattered high and dry along the river bank.*

VIEW OF THE DISASTER OCCASIONED BY THE FLOOD IN THE CHICAGO RIVER ON THE 12TH OF MARCH, 1849.

*Chicago River, main branch, 1875. The city appears well recovered from the great fire of 1871 and the river is already an avenue of heavy commerce. Raw sewage flowed directly into the river.*

Illustrations on this and facing page courtesy Chicago Historical Society

*Chicago River, Lake Street Bridge, 1871, shortly before the great fire. Every foot of the river's edge was already given over to commerce.*

Another pollution control plan which is linked directly to the river is the Prairie Plan, now in operation by the Sanitary District. It relates specifically to the recycling of sludge, or solid waste material, in a way which is non-pollutive to either water or air. The waste, in short, will be used in a very natural way—as fertilizer.

Here is how it works: Waste water processing has an end product—sludge. It used to be heat dried and incinerated, causing air pollution. After-burners were designed, but the process became very expensive to operate and makes minimal use of the product. So an experiment was tried and met with great success—at least in the minds of many environmentalists and men of foresight who believe in solving a problem in an economically feasible, ecological manner.

The sludge is barged as liquid fertilizer to Fulton County (west of Peoria), where the Sanitary District holds over 10,000 acres of denuded land—the site of a former strip mine. This offers an opportunity not only to recycle liquid fertilizer, but to reclaim land which had been totally spoiled by mine operations. It also offers job opportunities to local people and fulfills needs of both Cook and Fulton counties.

In Fulton County, 765 acres were put back into productive agricultural utilization in 1972; by the beginning of the 1974 growing season nearly 3,000 acres will have been reclaimed for agricultural use. The district raised a corn crop that sold for $55,000! The district envisions the eventual treatment of all sludge by this method, with 30,000 acres needed. All water reclamation plants would participate. Construction of a 180-mile pipeline to Fulton County is anticipated, thus reducing the major cost—barging—of the entire operation.

It is impossible to separate the story of the river from these plans and projects. Much as one would like to see attractive communities of homes and public areas along the banks, brightened by grassy parks and pedestrians strolling along a Parisian-type quai, one first must have clean water. It may seem to some observers who peer down from the bridges that span the river encircling the Chicago Loop, that the river will never be lovely again. One sees the telltale bubbles, the slime, the solid debris of civilization, and the rat-infested waste land along the banks.

But it has been shown that self-contained communities could indeed exist along the river. A combination of varied housing, public facilities, and shops would be strung together, with the river as the focal point. It could work.

The day of the mink and the muskrat are, of course, gone forever. But the river can be preserved as a natural resource, available and suitable to an environment which consists of humans and their complex needs. What more logical place in the city to retain a form of nature which can provide both beauty and use to present Chicagoans as it did in centuries past to Indians, and to the variety of animal life around it.

*Construction proceeds on the Sanitary and Ship Canal in the late 1890s. Much of the 28 miles was through solid rock underlying the continental divide.*

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鼻煙壺

*Berthold Laufer, distinguished sinologist and former curator of the Department of Anthropology at Field Museum, described this creamy white bottle of soft paste ceramic as "one of the most admirable compositions ever brought out on a snuff bottle, remarkable for its great scope concentrated on so small a space, for the spiritual treatment of the subject, and for the masterly executions and the delicate tracery of the lines." Eighteen Buddhist deities are shown in high relief.*

*Carved red lacquer (cinnabar) with genre pictures in high relief showing boys at play.*

# Snuff Bottles

By Alice K. Schneider

"If one insists on having only things of perfect beauty, one shall certainly excite the envy of the gods. And if one insists on collecting only things of great rarity, one shall certainly end up with nothing but fakes. And this applies not only to pictures and autographs, but also to all other antiques."

—So remarked Lu Shih-hua, an 18th-century Chinese connoisseur of the arts whose wisdom and understanding were partly encouraged

*Alice K. Schneider is an associate, Department of Anthropology.*

Caption information from *Catalogue of a Collection of Ancient Chinese Snuff-Bottles* by Berthold Laufer, Chicago, 1913; privately published.

*Blue and white porcelain decorated with imperial five-clawed dragons playing ball. Yung-cheng period (1723-35). Lip is characteristic of early medicine bottles.*

*Opaque brown glass painted with green, red, and yellow enamel; floral design of orchids and lotus.*

*Milky glass in cameo style, with decorations of ancient bronze vessels in black and red—a motif known as the nine tripod vessels of the legendary emperor Yü.*

by his great modesty of means. In his *Catalogue of Autographs and Paintings Seen in Wu-yüeh,* published in 1777, Lu further suggested that the best criterion is whether or not the object you are considering appeals to you.

Chinese snuff bottles are a classification extraordinaire. They cannot be ranked among the great arts; few were even signed or dated. They are of little importance to the modern archaeologist, having appeared, had their culmination, and declined within a century and a half of the Ch'ing dynasty (1644-1912). Many of these bottles were never used for snuff. They were, in fact, mere playthings of the court and gentry, largely created as collectors' items, and remaining as such. But because they are a distillation of the culture of that period, snuff bottles, in sum, have their own special historic significance. In a single exquisite bottle can be seen the essence of several thousand years of sophisticated artistry. And the joy of it is that you can hold this in the palm of your hand!

The snuff bottle collection at Field Museum is among the world's finest. It includes examples of a wide range of materials, technical skills, and creative ingenuity. Except for a few that were donated or were purchased from other sources, most of the 495 bottles in the collection were acquired in 1936 as part of a large bequest of the late Frances Gaylord Smith, of Chicago. The Smith bequest included a variety of other Chinese art forms, notably exquisite jade carvings, porcelain vessels and figurines, silk embroideries, and tapestries. As a whole, the Smith collection is one of Field Museum's great treasures. Hall 24, the George T. and Frances Gaylord

*Transparent tea leaf-colored crystal showing narrow spoon attached to stopper.*

*Glass painted on the inside, front and back. "One night a north gale arose, and for many miles the sky was thickly enveloped by clouds. The air was filled with snowflakes, tossed around in wild dance, and the mountains were coated with ice. Leaves of conifers and opening buds flew round. Astride my donkey I am crossing a small bridge, solitary, heaving a sigh that the plum blossoms are so slender." —Ma Shao-tsian, artist (dated and signed).*

*Dark brown and yellow fossil amber.*

been brought by Dutch traders. Snuff-taking became popular with the wealthy, who attributed to it "medicinal virtues and beneficial effects, particularly after a heavy dinner." A vigorous sneeze drew compliments. It was considered well to carry snuff on one's person, much as we carry aspirin today. Small medicine bottles, recognizable by their rounded lip, were first used for this purpose, setting a style for later containers of snuff. Not until the late 17th century did the true snuff bottle appear. While the medicine bottle had customarily been cylindrical in form, its offspring—the snuff bottle—was broadened and flattened for ease of carrying. It had a stopper, often fashioned from an entirely different material than that used for the bottle, and a narrow spoon attached to the stopper. The powder was removed from the bottle with the spoon; this, in turn, transferred the snuff to the nose to be inhaled.

Most bottles were made from stone, glass, or ceramics. Of the latter, highly prized are the K'ang-hsi blue and white, the Ku Yueh-hsuan (moon pavilion) porcelains, and the carved soft paste I-shing ware (so-named for the locality of origin). Of glass bottles, those which are mottled, or have a multicolored carved overlay, or which are painted on the inside and signed (a late 19th-century innovation) are the most coveted. Of bottles made from stone, the apple-green jades, gold-flecked dark blue lapis lazulis, and rare crystals will always be sought, particularly as these raw materials become even scarcer. But bottles were also made from amber, wood, nuts, lacquer, coral, horn, ivory, metal, bamboo, shell, or from virtually any material—dried tangerine skin, for example—that caught the fancy of the artist. Among these bottles, too, are prima donnas such as those made from the beak of the hornbill, intricately carved cinnabar lacquers, or from unusual ambers or corals. Field Museum's snuff bottle collection

Smith Hall (ancient Chinese civilization), is a memorial to the donor and her husband.

It is noteworthy that a catalog of of the Smith collection was privately printed in 1913, twenty-three years before the bequest was made. Its author, Berthold Laufer (1874-1934), formerly Field Museum's curator of the Department of Anthropology, is still regarded by many Chinese as the most distinguished western sinologist. The Laufer catalog, itself, has become an authoritative classic on snuff bottles, and a collector's item.

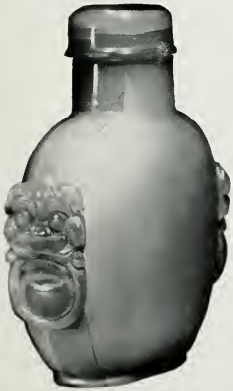
Laufer mentions in his catalog that although tobacco was known in China as early as the 16th century, snuff was not introduced until one hundred years later by way of Japan, where it had

is especially notable for its jade, lapis lazuli, coral, amber, hornbill, and glass —particularly glass bottles with multiple overlays of color, and those of glass imitating other materials. Some of these imitations are, by visual examination alone, impossible to distinguish from their non-glass counterparts. My own preference is moss agate. The designs carved from the natural inclusions of the stone are the poetry of the snuff bottle world. It takes an experienced eye to recognize the spirit held in a raw piece of such stone, and a skilled craftsman to release this spirit. Such a piece is never static!

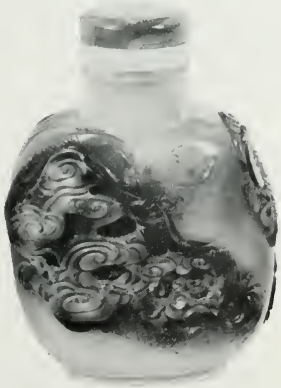
It is this sensitive understanding of his material, guided by discipline and centuries-old tradition, that enables the Chinese craftsman to produce a work of art. His guidelines go back more than 3,000 years to the majestic bronzes of the Shang and Chou dynasties, which periods produced a skill that has never since been recaptured or equalled. But the influence of these ancient bronzes is still to be seen in ceramics, carved jades, and even in snuff bottles that were to evolve centuries later. Today there is a reawakening of interest in these small bottles. While other treasures of Chinese art have largely vanished from the market—ensconced in private collections or in museums—there has been a busy trading of choice bottles among collectors. In shops these are being replaced by contemporary bottles. The new ones cannot compare with those of the 18th and 19th centuries, because the master carvers are gone. But if we cannot have the beautiful originals, then the good copies must do.

*And why should not these minor items represent the innermost thought of the ancients, and harbour their wisdom?*— Lu Shih-hua, "the mountain recluse listening to the pines when he found himself at leisure while fleeing the summer heat," written in the sixth moon of the year 1776.

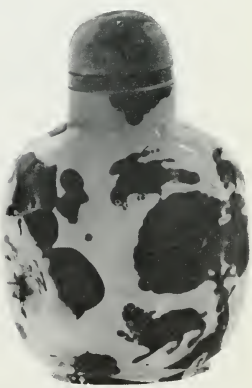
*Pair of light red coral with relief designs from geometric style of ancient Chou bronzes; dragons facing each other with bodies formed by square spirals.*



*Hornbill; carved lion heads on sides; one of a pair.*



*Fortification agate with relief design in brown, ivory, and yellow, depicting dragon soaring in clouds.*



*Grey moss agate with flat relief in brown; design shows a large tree with nesting birds, a fox, and other animals.*

# FIELD BRIEFS

## Field Museum Hosts Eight-Year-Old Artist-Paleontologist

*Eight-year old Joel Spears, already a budding expert on prehistoric animals, spent a few hours behind the scenes at Field Museum in October with assistant curator of fossil reptiles and amphibians John Bolt. Museum officials invited Joel, son of Prof. and Mrs. Richard Spears of Glenview, to view fossil specimens when they learned that Joel was a winner in the Chicago Tribune Magazine's children's art contest. Joel's winning drawing was entitled "Helping to Set up the Dinosaur Bones at the Field Museum."*

Photo by John Bayalis, Jr.

## Birds from Bolivia

It was a little like Christmas recently for Field Museum's Division of Birds and the Division of Amphibians and Reptiles when a huge crate containing several hundred zoological specimens arrived from Bolivia. Included in the shipment were 640 bird skins, about 100 bird skeletons, 100 birds preserved in formalin; and 177 snakes, lizards, and frogs. The specimens were collected in the Chiquitos Hills on the eastern slopes of the Andes by Roy Steinbach, who is also collecting fishes, insects, and mollusks in that region for the Museum.

The birds in the shipment represented about 35 families and more than 100 species, including some that are new to the Museum's collection. The specimens must now be positively identified and catalogued, then assigned to their respective places in the collection. Those preserved in formalin must be washed in water, then placed in alcohol. These will be used for anatomical studies. The bird skeletons will next be subjected to a "worm bath"—placed with live dermestid beetles, the grubs of which eat soft tissues still adhering to the bone. This method of cleaning is highly efficient and, unlike chemical cleaners, it leaves the bone unharmed.

Among those specimens received by the Division of Amphibians and Reptiles, a group of coral snakes and coral snake mimic are of special interest.

Dianne Maurer, assistant, Division of Birds; Dr. Melvin A. Traylor, curator of birds; and Mrs. Margot Merrick examine part of a large shipment of birds recently received from Bolivia.

## Exhibits for Blind Visitors

The Museum's visually impaired visitors are now getting more enjoyment from their tours. Eighty-seven artifacts have been designated as "touchable" for the blind. They are part of the Museum's permanent displays, located throughout the building in their respective subject areas. The objects were chosen for their diversity of textures, shapes, sizes, and materials.

Among the objects are a piece of elephant hide, houseposts and totem poles from the Pacific Northwest, bones and skeletons, a fossilized tree stump, large iron meteorites, wood and stone carvings, and the 28 famous "Portraits of Man" sculptures by Malvina Hoffman.

A list of the objects and their locations is available at the information desk for use by persons accompanying visitors with impaired vision.

## Entomologist Collects Rare Snake

Like other Museum scientists, Dr. John Kethley, assistant curator of insects, keeps a watchful eye for specimens that might be of interest to his colleagues in other departments. While in Costa Rica recently (looking for millipedes and mites), Kethley was the recipient of a tiny snake that had been unearthed by a bulldozer working nearby. Recognizing the snake as unusual, he persuaded it to return with him to the Field Museum where herpetologists subsequently identified it as the twelfth known specimen of a species of Central American burrowing snake.

The main purpose of Kethley's trip was to study the behavior of mites that parasitize millipedes. As occasionally happens on field trips to distant regions, Kethley encountered unusual climatic conditions—in this case severe drought—that hampered his behavioral investigations. With less difficulty he was able to make population and distribution studies of millipede species. His work, which coincided with that of Drs. Burger and Gentry of the Department of Botany, was mostly in the Caribbean lowlands and in highlands of the Pacific slope. He also did some collecting in Georgia before returning to Chicago.

Kethley was accompanied by Dr. John A. Wagner, chairman of the Science Division at Kendall College, Evanston, Ill. and a visiting Museum curator under a National Science Foundation grant to the Division of Insects. Wagner did field work on microcoleoptera (tiny beetles) and on arthropods occurring in forest litter.

music for dancing entertainment refreshments
4 p.m. to 7 p.m., Friday, December 14

Please send me _____adult tickets $10 _____child (under 14) tickets $5
Name_____
Address_____

For information or reservations please call the Women's Board, 922-9419.

## Capital Campaign Luncheons Continue

Photo by John Bayalis, Jr.

*Luncheons at the Museum for prospective donors to the Capital Campaign continue to play an important role in the Museum's efforts to explain its needs to officials of corporations and foundations. Recently, Capital Campaign Group Chairman John H. Perkins (left), president, Continental Illinois National Bank, hosted a luncheon followed by a tour of the Museum's public and non-public areas. With him is Section Chairman Gordon Bent (2nd left), Museum trustee and partner in Bacon, Whipple & Co. They discussed the Museum's rehabilitation plans with (from right) Kendon T Birchard, vice president of the National Security Bank of Chicago; David C. Meyers, assistant to the chairman, Central National Bank of Chicago, and Lawrence B. Bloom, vice president, Amalgamated Trust and Savings Bank.*

## 80th Birthday Celebration Spotlights Capital Campaign

Photo by John Bayalis, Jr.

*Chicago-area media boosted the Museum's efforts to raise its $12.5 million share of the $25 million to be spent on its rehabilitation program, when the Museum celebrated the 80th anniversary of its founding on September 16. In photo at left, Nicholas Galitzine, trustee and general chairman of the Capital*

Photo by John Bayalis, Jr.

*Campaign, reviews high points of the Museum's history with Mrs. Edward Byron Smith, immediate past president of the Museum's Women's Board (center), and current President Mrs. B. Edward Bensinger. In the Museum's Picnic Room, visitors joined the celebration with servings of punch and cake*

# CALENDAR

## Exhibits

Continuing

**Field Museum's Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Film Program

**Ayer Adult Film Lecture Series,** offered at 2:30 p.m. Saturdays in the James Simpson Theatre. The November 17 program will also be presented at 7:30 p.m. Friday, November 16.

November 3: **"New Hebrides,"** narrated by Kal Muller.

November 10: **"Panama,"** narrated by Col. John Craig.

November 16 and November 17: **"China: The Awakening Giant,"** narrated by Jens Bjerre.

November 24: **"Indonesia,"** narrated by Dr. John Nicholls Booth.

Join us for coffee after the Friday evening, November 16, film lecture presentation and meet speaker Jens Bjerre.

## Special Events

**Ray A. Kroc Environmental Education Program,** the first in a series of ecology-oriented films, field trips, and children's workshops.

The program is made possible by the Ray A. Kroc Environmental Fund, set up by friends to honor Mr. Kroc, chairman of McDonald's Corporation, on his 70th birthday.

### Films

Presented at 7:30 p.m. Fridays and 10:30 a.m. Saturdays in the Lecture Hall.

November 2 and 3—Double feature: **"Should Oceans Meet?"** explores the possible ecological consequences which would be created by building a sea-level canal in Panama to link the Atlantic and Pacific. **"Of Broccoli and Pelicans and Celery and Seals"** examines the ecological effect of pesticides sprayed on fields in California.

November 9 and 10: **"Death of a Legend"** describes the life story of the wolf and its struggle for survival.

November 16 and 17—Double feature: **"Prairie Killers"** shows how man, the predator, has devastated his environment during the past 100 years by the systematic elimination of the wild animal population. **"Tragedy of the Commons,"** based on an essay by Garrett Hardin, looks at the effects of overpopulation on the resources of a finite earth.

### Field Trip

November 3: **"Maintaining a City Within a City"** visits the John Hancock Center, a miniature urban ecosystem, and tours the Chicago Sanitary District. Bus departs from Field Museum at 9:45 a.m. Led by Dr. William Burger, associate curator of vascular plants.

Participation is on a reserved basis only. A $4 fee covers lunch and transportation. Checks made out to Field Museum, together with names, addresses, and telephone numbers, should be mailed to Mrs. Carolyn Blackmon, coordinator of special educational services, Field Museum. For further information call 922-9410, Ext. 361-363.

### Workshops for Young People

Two separate, single-session workshops on Saturdays, November 3, 10, and 17.

10 a.m. **"Mini-Environments."** (Ages 9-13) Children are shown how to construct their own mini-environments, to be taken home with them, and instructed on their care and upkeep.

1 p.m. **"Ballad of a Disappearing Legacy: Demise of the Wolf."** (Ages 12-17) A discussion of the anatomy, behavior, and role in nature of this endangered animal, as well as the characteristics of other vanishing species.

Class sizes are limited and advance registration is necessary. For reservations and information call 922-9410, Ext. 361-363.

## Children's Program

Through November 30

**Fall Journey for Children,** "Plant Your Dinner," a free self-guided tour of Museum exhibit areas. The journey not only acquaints youngsters with botanical displays, but encourages them to learn more about plants by growing their own live specimens at home. All boys and girls who can read and write may join in the activity. Journey sheets available at entrances.

## Meetings

November 8: 8 p.m., Chicago Mountaineering Club.

November 11: 2 p.m., Chicago Shell Club.

November 13: 7:30 p.m., Nature Camera Club of Chicago.

November 13: 8 p.m., Chicagoland Glider Council.

November 14: 7 p.m., Chicago Ornithological Society.

November 14: 7:30 p.m., Windy City Grotto, National Speleological Society.

## Coming in December

Winter Journey for Children, "Southwestern Indians—The Desert Tribes," begins December 1.

**"Exploring Big Bend,"** free wildlife film narrated by Charles T. Hotchkiss, presented by the Illinois Audubon Society at 2:30 p.m. Sunday, December 9, in the James Simpson Theatre.

## Hours

9 a.m. to 4 p.m. Monday through Thursday, 9 a.m. to 9 p.m. Friday, and 9 a.m. to 5 p.m. Saturday and Sunday.

The Museum Library is open 9 a.m. to 4 p.m. Monday through Friday. Please obtain pass at reception desk, main floor north.

Museum telephone: 922-9410

Volume 44, Number 11
December 1973

# Field Museum of Natural History Bulletin

**Field Museum of Natural History Bulletin**

Volume 44, Number 11
December 1973

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## contents

**COMET KOHOUTEK**
Brilliant celestial visitor visible in December
By Albert V. Shatzel 3

**GILLY THE DINOSAUR BUILDER**
A sketch of the Museum's chief preparator of fossils
By Patricia M. Williams 4

**THE HOSPITALIZATION OF FIELD MUSEUM**
How the Museum nearly became a hospital
By G. Henry Ottery 6

**FIELD BRIEFS** 8

**CAPITAL CAMPAIGN** 10

**CALENDAR** 11

**APPOINTMENT CALENDAR FOR 1974**
In honor of a major Museum presentation, "Contemporary African Arts Festival," opening March 30 12

COVER

An early 19th-century redrawing of the *Bayeux Tapestry*, a work originally done in the 11th century, shows Halley's Comet on the eve of the Battle of Hastings (1066). The "caption" at the top, *ISTI MIRANT STELLA* may be roughly translated "The men marvel at the star." Comet Kohoutek (see page 3) is expected to rival Halley's Comet when it puts on a spectacular show in December and January.

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# *COMET KOHOUTEK*

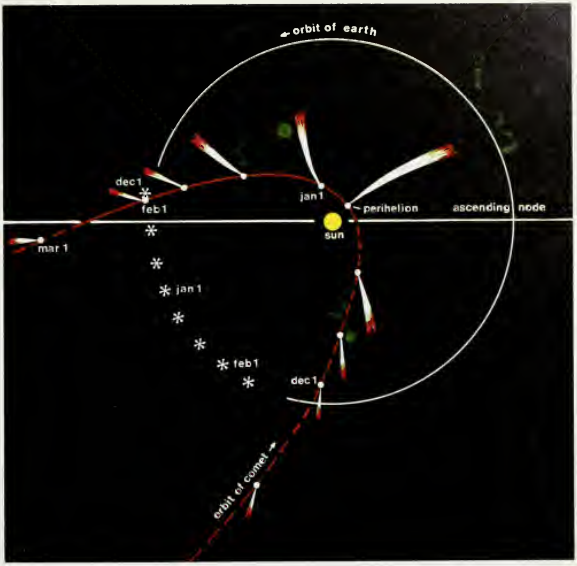
## *brilliant celestial visitor visible in December*

By Albert V. Shatzel

Comets are among the most intriguing of celestial visitors, arriving as they often do unannounced, dramatic in appearance, exhibiting sudden changes in structure, and fading into oblivion after only a few weeks or months on the celestial stage. The few which are visible to the unaided eye attract special attention, and until quite recently were regarded with awe and superstition, as omens of evil and harbingers of the plague or other dread events. A comet, quite by coincidence, foretold the death of Charlemagne, and others have been credited with similar spectacular powers.

In reality, however, most (if not all) comets are members of our solar system, moving around the sun in elliptical orbits, as do the planets and their lesser relatives, the asteroids. The orbits of most comets are much elongated, so that they move outward well beyond the orbit of the most distant planet, Pluto, and may require thousands of years to complete a single circuit of the sun. They seem to be made up of fragmentary dust-size particles, although the nucleus may be a more or less compact mass of appreciable dimensions (perhaps a few hundred feet or more across).

*Albert V. Shatzel is a volunteer photographer for Field Museum and a faculty member of Kendall College.*




*The path of Comet Kohoutek as seen from above the plane of the earth's orbit. Perihelion (when the comet comes closest to the sun) is December 28. The ascending node is the point at which the comet passes north through the plane of the earth's orbit. Positions of earth and comet are shown at 10-day intervals.*

As a naked-eye comet approaches the sun it develops a tail which points generally away from the sun. It also increases rapidly in brightness as it nears perihelion (the point in its orbit nearest the sun). Research has shown that the comet's light is derived in part from sunlight reflected from solid particles and partly from glowing gases. Some of this material is "pushed" away from the sun by radiation pressure and other little-understood mechanisms.

There are always several comets around bright enough to be photographed with a telescope; a dozen or so are currently within reach. At least eight have been discovered thus far in 1973 and more are certain to appear. The sixth, designated 1973f, was discovered at Hamburg Observatory on March 7th by Lubes Kohoutek, only eight days after he had discovered Comet 1973e. Comet Kohoutek promises to be unusually bright, perhaps brighter than any comet seen so far in this century, and may even become visible in the daytime sky. It is always wise to hedge a bit on such predictions, since we have no way of knowing precisely how bright it may become. It passes perihelion on December 28, at which time it will be only 13 million miles from the sun (compared to a distance of 36 million miles for Mercury—the planet closest to the sun). Prior to that time the comet will be a brilliant object in the morning sky rising in the southeast before sunrise during early December, brightening gradually until the morning twilight begins to interfere (about December 20). At this time Comet Kohoutek will rival Venus in brilliance. It will again be visible in the evening sky about New Year's day, setting after the sun in the southwest. It will appear higher and higher in the sky and fainter and fainter each night as it

*(Concluded on page 11)*

# GILLY THE DINOSAUR BUILDER

By Patricia M. Williams

A small notice posted in the Department of Geology office reads "Rare monsters fabricated to any specification. Orville Gilpin & Associates." Although the notice is not meant to be taken seriously, it could well be. For over thirty years Orville Gilpin, chief preparator of fossils, has been reconstructing prehistoric monsters in all sizes for Field Museum.

The huge dinosaur skeletons displayed in Stanley Field Hall are the largest creatures Orville "Gilly" Gilpin has mounted and it took him two years (1954-56) to do the job. The *Lambeosaurus* bones were found in the Badlands along the Red Deer River in Alberta, Canada, and came to the Museum in the early 1920s. The *Gorgosaurus* was purchased unassembled from the American Museum of Natural History; then Gilly and his assistants went to work. They first removed the top layers of rock from the *Lambeosaurus*, which had been collected in seven pieces. Since this dinosaur was to be exhibited in a prone position, Gilly left it resting in the same rock in which it had lain for some 60 million years. He then put the seven pieces on dollies, fitted them together, and filled the seams between the blocks. Even today the *Lambeosaurus* remains on these dollies, which proved helpful when the dinosaurs were moved.

The erect *Gorgosaurus* skeleton, however, presented a greater challenge to Gilly's ingenuity. First, like a fantastic and ancient puzzle, the bones were spread out and sorted—the vertebrae arranged in proper sequence, the limb bones according to their position in the legs, and so on. Calling on knowledge accumulated during his years at the Museum and with the aid of the scientific literature, Gilly was able to readily identify these bones and place them in their proper positions.

Because the skeleton was to be free-standing, internal metal supports were to be used. This meant that bones had to be drilled or broken and repaired, and restored many times. Working in the low-ceilinged paleontology laboratory, Gilly and his aides had to mount the dinosaur in sections. First the neck, head, and rib cage were carefully assembled. Then, following a tedious "fit and try" method, bolts of proper size were selected and iron rods put through bones of the rear legs and pelvis and welded together.

*Orville "Gilly" Gilpin (rt.) and an assistant complete finishing touches on the* Gorgosaurus *skeleton, 1956.*

As the skull and jaws of the towering *Gorgosaurus* weigh more than 200 pounds, special steel braces were required to support them. Slowly and painstakingly Gilly fashioned two pieces of iron rod to run through the vertebral column into the skull, and metal plates were inserted between the vertebrae. All along the way Gilly had to shape the rods by heating them in the Museum's huge furnace and then bend them to fit the skeleton. Properly bent and shaped, the pieces of iron were taken to a steel works where they were to serve as a pattern for the final high-strength steel braces. Unfortunately, the steel work's night clean-up crew mistook the crooked iron pattern for waste material and cut it into pieces for disposal! Rather than spend time needed to make a new pattern, Gilly estimated the width of saw cuts and precisely reassembled the original pattern.

After the many trial-and-error tests necessary for every bend in the iron, for every hole drilled in the bones, and for every fitting made, the *Gorgosaurus* lower section (pelvis, hind legs, and tail) was assembled. The now two-part skeleton was taken to the Museum's spacious paint shop on the fourth floor and for the first time the complete skeleton rose to its full height. Then, with apparently inexhaustible patience, the *Gorgosaurus* had to be taken apart again to be transported to Stanley Field Hall. Finally reassembled there, the standing *Gorgosaurus* became the

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*Patricia M. Williams is managing editor of Field Museum's scientific publications.*

world's first self-supporting dinosaur skeleton.

Installed in 1956, the Museum's *Gorgosaurus* and *Lambeosaurus* are not only scientifically accurate but aesthetically satisfying as well. *Gorgosaurus*, the carnivore (flesh-eater), is triumphantly raised over the defeated herbivore (plant-eater). *Lambeosaurus* stands in a very natural and lifelike pose. As Gilly says, "It can stand there for centuries and not get tired."

A problem worse than fatigue set in when the skeletons were moved in 1968. The heavy skull of *Gorgosaurus* was to be cast in fiberglass. In the process it fell and was smashed on one side. Gilly worked all night to repair the skull so that work could proceed on schedule the following morning. Impressive as the dinosaur pair in Stanley Field Hall is, Gilly considers the *Edaphasaurus* and *Dimetrodon* skeletons in Hall 38 to be his finest work. These restorations went well, and he "felt good about it" and, again, they are posed so that they look "comfortable."

Not all of Gilly's projects are as spectacular as those on exhibit. His day-to-day work consists of removing matrix (the rock in which fossils are embedded) from specimens and preparing them for study or exhibition. Fossils to be used only for study are not mounted; and missing pieces are not restored. Those specimens which are to be used for exhibition are restored to their original shape as nearly as possible and plaster is added in place of missing parts. For example, a turtle shell from Wyoming had been crushed and flattened during fossilization. Gilly recently restored it by assembling the hundreds of pieces —all of which look alike to the untrained eye—rebuilding the shallow, dome-like shape of the shell, and bonding the pieces together with plaster.

Simply removing matrix is a time-consuming, tedious, and often delicate job performed with improvised tools. Gilly spent 18 months scratching and scraping with a "brush" of phonograph needles mounted in a metal handle before a large Pennsylvanian shark—formerly on display in the "Illinois By the Sea" exhibit—could be revealed in its present wealth of detail.

Gilly came to Chicago with the hope of working outdoors, and never dreamed of doing so as a preparator. Born in northern Minnesota, Gilly taught there "in a little red schoolhouse—all eight grades in one room." He then returned to school to study forestry and came to Chicago with the hope of working in the forest preserves. Jobs were not plentiful in the 1930s; Gilly had to take a short-lived job in a factory and soon found himself laid off. After searching in vain for another job, Gilly turned to the Works Progress Administration (WPA) and was sent to Field Museum where "they gave me a hammer and a chisel and a bone to clean up. I took to it like a duck to water and I've enjoyed it ever since."

Gilly advises young people interested in this work to obtain practical training by volunteering at a museum or obtaining a government-financed assistantship, since schools don't offer courses in dinosaur-building or fossil preparation. Gilly has trained several young people, including preparator John Harris, and he believes that the main qualification for fossil preparation is "being able to coordinate the hands and the mind." He explains that each fossil is unique—"you only get one chance at it"—and each presents its own problems. A preparator must be able to analyze the problems in scraping or restoration and find his own solutions. This problem-solving may well include improvising one's own tools and techniques.

One of Gilly's dreams is to someday reconstruct the skeleton of a *Stegosaurus*—one of the rare Jurassic dinosaurs. With the fervor of a politician in election year Gilly says, "the children and people of Chicago are entitled to a *Stegosaurus!*" The problem is that *Stegosaurus* skeletons are extremely rare. The Museum has none and it could take ten years of expensive searching to locate one. Although it would be possible to buy casts of *Stegosaurus* bones, Gilly refuses to settle for less than the real thing, the best—"something befitting Field Museum."

*Gilly's reconstruction of a fossilized* Dimetrodon, *an ancient reptile, is in Hall 38.*

While there are no funds currently available for a *Stegosaurus* search, that situation could change. In his lab Gilly has a flower-bedecked coffee can topped with a sign reading "Save the *Stegosaurus* Foundation." A slot in the top of the can is big enough to accept coins and bills of all denominations. So far only toy money has been contributed, but Gilly is a patient man and the fund-raising drive may continue for a long time.

# *The Hospitalization of Field Museum*

By G. Henry Ottery

The trustees and staff of Field Museum had more than one reason to breathe a heavy sigh of relief at the end of U.S. involvement in World War I. It also signalled the end of the U.S. Army's intent to modify the Museum's Grant Park building, then under construction, for use as a convalescent hospital for returning wounded soldiers.

The government's plan was first revealed by Museum President Stanley Field to the board of trustees during a special meeting at the Chicago Club (then at 400 South Michigan Avenue), on September 18, 1918. Field had called the meeting ostensibly to consider a joint report from the new building's architects and the building committee. It called for modifications, substitutions, and omissions of materials and plans provided for in the specifications of the new building, in order to reduce its cost and complete it within the estimated funds available. The report, of considerable length, was studied and discussed in great detail before it was approved by the trustees. They couldn't yet know that the government would soon present its own plans for cost-cutting and other alterations.

Then came the startling news. Mr. Wallace G. Clark, acting for J. Milton Trainer of the U.S. Army's General Staff, Real Estate Service, Hospital Division, had called upon Field and presented to him the possibility that the government would desire to occupy the new Museum building for an indefinite period as a convalescent hospital. The government would assume certain responsibilities and obligations and expenses necessary to prepare the building for its use. Field had agreed to present the matter to the trustees, although he had warned Clark he believed that, under the circumstances, it would be negatively received.

What "circumstances" could possibly have prevented these patriotic and humane men from wholeheartedly accepting such a proposal? One can imagine that such items as construction changes, unforeseen drains on the Museum's funds, and even the permanent loss of the new building and its land were possibilities to be considered.

Of even greater concern, however, was the Museum's ability to continue to function as a research and educational institution. The building the Museum was occupying in Jackson Park had been built to survive only the summer of 1893, when it was the Fine Arts Palace of the World's Columbian Exposition. Now it was 25 years old and literally falling apart, endangering not only the collections and staff, but also the visitors. Only a major and thorough rebuilding program could make it habitable for several more years.

#### Urging abandonment of plan

Field also told the trustees that Brigadeer General W. E. Noble of the surgeon general's staff would be calling upon him to further discuss the matter; Field asked for instructions from the trustees.

After fully discussing the government's proposal, the trustees drew up a formal statement asserting that while they recognized their "patriotic obligation to do all and everything in their power to meet the emergencies of the war" and would consider it "an official and personal privilege to meet any suggestions, or grant any requests, or perform any act" that the government in the circumstances of war might call for,

> Nevertheless, they recognize their responsibilities as trustees of priceless educational material and of scientific objects and collections it would be impossible to procure or reproduce, they respectfully represent that the occasion for pushing the completion of the new building in the face of largely increased expense of labor and construction material has been considered imperative because of the insecurity of the building at present occupied as a Museum, whose weakening and decaying condition has become an extreme menace to the security of the collections, exhibits and other scientific and educational materials now contained therein by reason of the constant danger of the collapse of the building in parts, if not as a whole, and the constant hazard of fire. The destruction of this material by reason of the character of its endowment and the source of its income would result in the entire abandonment of the Museum and the discontinuance of the great educational work it is now performing. Such calamity would render the new building useless to the trustees.

They concluded by stating that the board "begs the representatives of the United States Government to withdraw the proposal to occupy the new Field Museum building in Grant Park."

#### Friendly (?) persuasion

President Field presented the trustees' statement to Gen. Noble and other representatives of the government. Many meetings, conferences, and interviews followed, with the Museum's

*Stanley Field as a young man*

architects in attendance. The government presented its arguments. The Museum attempted to dissuade. The government insisted. The Museum objected.

When Field reported back to the trustees on October 3, he knew the Museum had lost the argument. He told them that the government was firm in its desire to occupy the building, intended substantial renumeration, and would meet as far as possible the necessity for partial occupation of the new building by the Museum. Field had reached the conviction that an arrangement should be entered into as satisfactory as further negotiations would permit. The trustees approved a motion permitting the concluding of negotiations.

Further, they authorized the government's use of the lumber that had been accumulated for Museum construction in the erection of several temporary buildings to be used for hospital purposes. On a blueprint dated October 19, these buildings, directly to the south of the Museum, included the main kitchen, the nurses' quarters and mess hall, soldiers' barracks, a fire station, and a garage —all connected to the Museum by a covered passageway. To the north, a military canteen was planned.

**The Army's specifications**

On October 17, only one day less than a month after Field originally presented the government's proposal to the trustees, a 53-point memorandum listing specifications for the "hospitalization" of the Museum was issued. The 53 points embraced changes to be made in the original specifications that had been prepared by the Museum's achitectural firm, Graham, Anderson, Probst & White.

The government substituted a one-inch layer of cement where terrazzo floors had been specified on the Museum's first and second stories. Temporary wood doors and frames were to replace the bronze and ornamental mahogany doors about the main entrances. Light fixtures throughout the building in general were to consist of bulbs at the ends of drop cords, with metal shades. A large elevator serving all floors was to be installed in addition to the one freight elevator, passenger elevator, and sidewalk lift shown in the original plans. All power plant equipment was to be installed in duplicate (except boilers, stokers, and coal- and ash-handling machinery) so that the building could be operated fully with any one piece of equipment out of service. One large open court and two small open courts were to be constructed in the west half of the first floor.

It is amusing today to think of the Museum having 220 "water closets" (with seats costing $4.90 each) and 35 enameled iron bath tubs, as designated by the government's planners. They were to be part of 716 plumbing fixtures that also included 140 showers, doctors' scrub sinks, a dental lavatory, diet kitchen sinks, and others.

**Termination of lease**

Meanwhile, in Jackson Park, the old building, too, was suffering the effects of the war. Museum Director Frederick J. V. Skiff, in the annual report for 1918, states that "The Museum has felt the common influence of the war upon its economic affairs, and operating upon a fixed income has reduced its expenditures as far as possible to the necessities of maintenance." Without touching the funds for the construction of the new building, how could the trustees ensure that the old, decrepit building would continue to be usable?

Fortunately, the uncertainty of the Museum's future was resolved with the European armistice. By the late winter of 1919—less than six months after the trustees first learned of the government's plan—the government sought to abandon its lease-contract with the Museum, signed on October 22, 1918. On March 7 the trustees authorized the signing of the release upon the Museum's receipt of $87,215.16 "in full payment for all obligations of the lessee to the lessor."

Thus, the Field Museum's future was back on course, and the building was constructed as originally intended. But the activities of those few months, as could be expected, had their effects. "The resulting increase in building operations in accordance with the terms of the contract, and the subsequent sudden cancellation by the government . . . had naturally a confusing and disturbing effect upon the affairs of the Museum," wrote Skiff. He noted that preparations for the transfer to the new building had been under way for some time at the signing of the contract, and that this activity was "more actively prosecuted" and packing methods were changed in the expectation that material would have to be stored for several years. Nonetheless, he concluded, the transfer to the new building would probably take place in the autumn of 1920.

And it did.

# FIELD BRIEFS

Photo by John Bayalis, Jr.

*During a luncheon meeting designed to acquaint business leaders with the Museum's forthcoming Contemporary African Arts Festival, Museum President Remick McDowell (left) and Maude Wahlman, Museum consultant in African ethnology, examine a color etching by Nigerian artist Bruce Onobrakpeya with (from right) Millard D. Robbins, Jr., president, Robbins Insurance Agency; Daryl F. Grishman, president, Parker House Sausage Co.; and Dr. Clyde Philips.*

*Below, Museum visitors during October included this woman and boy, both blind, from Denmark. By touch, they are examining "Bushman Family, Kalahari Desert," a bronze group sculpted by Malvina Hoffman. These visitors were among a group of ten blind Danes whose trip was sponsored by Disabled Americans Denmark Meeting (DIADEM); their Chicago visit was arranged by the Consul General of Denmark in Chicago.*

Photo by John Bayalis, Jr.

*Below, Dr. William D. Turnbull (left), Field Museum's associate curator of fossil mammals, confers with paleontologists Dr. Zofia Kielan-Jaworowska, of Poland; and Dr. K. N. Prasad, of India. Dr. Kielan-Jaworowska was here for a week's study of the Museum's Early Cretaceous mammals from the Trinity Formation of Texas. Dr. Prasad was here for nearly two weeks, mainly to investigate Eocene, Miocene, and Pliocene mammalian faunas of North America. Dr. Turnbull recently completed two months of field work and fossil collecting in Wyoming.*

Photo by John Bayalis, Jr.

*Busily decorating for A Christmas Afternoon at Field Museum are (from left) Mesdames Wesley M. Dixon, Jr., Henry D. Paschen, Jr., and B. Edward Bensinger. Friday, Dec. 14, from 4 to 7 p.m., is the time for the festive occasion, which will take place in Stanley Field Hall. Caroling, dancing to the merry tunes of Leo Henning's orchestra, sugar plum fairies, clowns, and a grand march are among the many attractions. With refreshments, of course!*

*Tickets are $10 for adults and $5 for children, and are available through the Women's Board of Field Museum, sponsors of the event.*

Photo by John Bayalis, Jr.

*Exhibits of Tibetan and Chinese cultural artifacts captured the attention of 85 members of the National Chinese Opera Theater during an October visit and reception at the Museum. Pictured with Miss Wu-Mei Ai of the Chicago Chinese Consulate office, four of the performers examine a Ming temple censer cast in 1548. The opera company, in Chicago for three performances, preserves the ancient art of Peking opera, banned from mainland China during the cultural revolution of the 1960s.*

## Do Christmas Shopping at Museum

Don't forget that one of Chicago's most interesting gift shops is located in the Museum, and that you—as a Member of the Museum—receive a 10 percent discount on your purchases. Choose from sculptures and jewelry from many lands, natural history books and objects, tapestries and tea sets, and other unique gifts too numerous to mention here. Shop anytime during normal Museum hours for those unexpected and exciting Christmas gifts.

## Fossils Discovered by Students in Museum-Aquarium Ecology Course

Sunfish, bass, northern pike, and gar, plus an as-yet unidentified turtle species, were among fossil animals recently found along the southern shore of Lake Michigan. The discoveries are helping to round out ecologists' understanding of the lake's fauna as it was some 6,000 years ago. Perhaps more important than the discoveries themselves is the fact that they were made by Chicago-area high school students, who were participants in a summer course on the ecology of Lake Michigan sponsored jointly by Field Museum and Shedd Aquarium. The students included Thomas Ardelt, Robert Bojanowski, Beth Braker, Francine Kaminsky, Bill Kiersch, Mike Lesser, Mary Millea, Andrea Moline, Adrienne St. Clair, and Sam Wengroff. Sue Teller, a graduate student at the University of Illinois, Circle Campus, is making a special investigation of the fossil discoveries.

*Brooches fashioned by Navajo Indians from turquoise and coral. The settings are of sterling silver. These are among a wide selection of hand-crafted items available at the Field Museum gift shop.*

## Work in Progress

We're "open for business" but it's not "business as usual," as museum employees and visitors are discovering. Nearly every day presents new evidence that Capital Campaign funds are being put to work to rehabilitate the Museum building and provide improved facilities and visitor services.

A peek over the barrier walls surrounding large areas of the north and south entrance steps reveals that the steps have disappeared. One gazes through steel beams, that once supported the steps, to the sinking concrete floor of what was once a storage area beneath the steps. The steps have been removed and carefully numbered so that they may be replaced in proper order after a new waterproof floor has been laid for them. Then the areas beneath the steps will be completely renovated to provide, at the north end of the building, administrative office areas, and, at the south, additional storage space.

Concurrent with this project, eight new emergency exits are being built in the north and south stairwells, level with the terrace surrounding the Museum. Workmen with jackhammers have had to cut through approximately two feet of brick, marble, concrete, and plaster in each location. The anticipated completion of this project and the rebuilding of the stairs will occur in July 1974.

Work necessary for the installation of a new interior freight elevator has begun, leaving the Museum without this service vehicle until approximately April 1.

In order to install the hydraulic elevator (replacing a hoist elevator), workmen will have to dig a hole approximately 90 feet beneath the floor of the Museum to accommodate the hydraulic equipment. The new elevator will serve all floors of the building. Work will soon begin on the installation of new passenger elevators; already, for this project, Hall M has been closed temporarily, and some exhibit cases have been removed from or repositioned in Halls K, 24, 13, 2, and 32.

Enclosure of the center west light well to provide additional laboratory, office, and storage space for scientific departments is expected to begin this month. For this project, Hall 18 will be closed temporarily and some exhibits in Halls 35, 36, and 38 will be disturbed.

The installation of a new security system will begin this month that will include smoke-detection devices, deterrents to theft, loudspeakers, new fire-fighting equipment, etc.

Conversion of the Museum's coal-fired boilers to natural gas was completed in the nick of time as cold weather moved into Chicago. The conversion of the three boilers involved modernization of controls and auxiliary equipment including pumps. The boilers also have the capacity to operate on oil. Another recently completed project is the installation of the scanning electron microscope laboratory, which has been operational for several weeks.

The many additional projects envisioned will take many years to complete. Where new construction is called for, some inconvenience to staff and visitors will be experienced, but the final result will be a more enjoyable visit to the Museum, as well as more efficient operations within the building.

Before the Capital Campaign concludes next September, the Museum must raise $2.3 million more from private sources in order to reach its $12.5 million share of the $25 million goal. (The other $12.5 million is being obtained through bonding authority of the Chicago Park District.) For this, the Museum will need the assistance of all of its friends.

Photo by John Bayalis.

*When the north entrance steps had been removed, Women's Board members (from left) Mrs. William L. Searle, Mrs. Rolly O. Swearingen, and Mrs. Thomas E. Donnelley II donned hard hats in order to examine the work, and took time out to have their photo taken.*

# CALENDAR

## Exhibits

Continuing

**Field Museum's Anniversary Exhibit** continues indefinitely. "A Sense of Wonder" offers thought-provoking prose and poetry associated with the physical, biological, and cultural aspects of nature; "A Sense of History" presents a graphic portrayal of the Museum's past; and "A Sense of Discovery" shows examples of research conducted by Museum scientists. Hall 3.

## Film and Tour Program

Sunday, December 9

**"Exploring Big Bend,"** free wildlife film narrated by Charles T. Hotchkiss, presented by the Illinois Audubon Society at 2:30 p.m. in the James Simpson Theatre.

December 26 through 28

Guided tours leave from the north information booth at 2 p.m.

## Children's Program

Begins December 1

**Winter Journey for Children,** "Desert People of the Southwest," focuses on the cultures of the Native Americans. The free self-guided tour provides youngsters with a unique learning experience as they become acquainted with Museum exhibits. All boys and girls who can read and write may join in the activity. Journey sheets available at entrances. Through February 28.

## Special Events

Friday, December 14

**"A Christmas Afternoon at Field Museum,"** from 4 to 7 p.m. Tickets are $10 for adults and $5 for children, and are available from the Women's Board of Field Museum.

## Meetings

December 11: 7:30 p.m., Nature Camera Club of Chicago.

December 11: 8:00 p.m., Chicagoland Glider Council.

December 12: 7:00 p.m., Chicago Ornithological Society.

December 12: 7:30 p.m., Windy City Grotto, National Speleological Society.

December 13: 8:00 p.m., Chicago Mountaineering Club.

## Hours

9:00 a.m. to 4:00 p.m. Monday through Thursday; 9:00 a.m. to 9:00 p.m Friday, and 9:00 a.m. to 5:00 p.m. Saturday and Sunday

Closed Christmas Day and New Year's Day.

The Museum Library is open 9:00 a.m. to 4:00 p.m., Monday through Friday. Please obtain pass at reception desk, main floor north.

Museum telephone: 922-9410

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COMET KOHOUTEK *(from p. 3)*

moves slowly away until late February, when it will fade gradually to less than naked-eye brilliance and disappear, not to return again for more than 50,000 years. During that time it will reach 3,000 times the earth's distance from the sun—some 279 billion miles. Nevertheless, it will be well within our solar system, since the nearest star beyond the sun is 25 times more distant still.

After many such circuits of the sun it will have dissipated its substance, and be spread out along its orbit as a cloud of particles too sparse to be seen or photographed. Old comets never die, they just fade away; and if the comet's orbit happens to intersect that of earth's, it may continue to entertain us at regular intervals as a shower of meteors.

## A Field Museum Membership Is Many Gifts in One

When you want to give something unusual for year-long enjoyment, remember that a Field Museum membership offers something for the whole family. To begin with, your gift recipient will receive this colorful issue of the *Bulletin* with the 1974 appointment calendar. Your gift will also include a beautiful portfolio of four-color reproductions of bird paintings. The new member, his family, and friends will enjoy unlimited free admission to the Museum at all times. Tickets to the gala Members' Nights and invitations to previews of new exhibits, such as the "Contemporary African Arts Festival" next spring, are also part of your gift. Membership also means a ten-percent discount on all purchases at the Museum's crafts and books shop. Just mail the coupon, below, or phone the Membership Department, 922-9546.

Mail coupon or facsimile to: Field Museum, Roosevelt Rd. at Lk. Shore Dr., Chicago, Ill. 60605

Gift recipient's name

Address

City State Zip

☐ *Annual $15* ☐ *Associate $150* ☐ *Life $500*

☐ *Send bird prints to gift recipient; or*

☐ *Send bird prints to me*

My name

Address

City State Zip

☐ *Check enclosed payable to Field Museum*

☐ *Please bill me*

☐ *Send gift card announcement in my name*

Traditional basket, with Ostrich eggs, by the Yei people, Botswana. (Collection of Mr. and Mrs. Robert M. Thomas, Jr.)

# january 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | NEW YEAR'S DAY Museum Closed 1 | Winter Journey for children continues 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | CHINESE NEW YEAR 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

Field Museum hours:
9 am to 4 pm Mondays through Thursdays;
9 am to 9 pm Fridays;
9 am to 5 pm Saturdays and Sundays

DECEMBER 1973

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | | 1 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 | | | | | |

FEBRUARY 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | | |

*Story of the Oshun River*, detail of aluminum panel, by Asiru Olatunde, Nigeria. (Collection of Mr. and Mrs. James

# february 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | LINCOLN'S BIRTHDAY 12 | 13 | "Janss Underwater Photography" exhibit opens VALENTINE'S DAY 14 | 15 | 16 |
| 17 | PRESIDENTS' DAY 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | | |
| | | | | Field Museum hours: 9 am to 4 pm Mondays through Thursdays; 9 am to 9 pm Fridays; 9 am to 5 pm Saturdays and Sundays | | |

JANUARY 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

MARCH 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | | | | | | |

Beaded bottle, Swazi people of South Africa.
(Field Museum collection)

# march 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | Spring Journey for children begins 1 | Free film lecture, "Hong Kong to Macao," 2:30 p.m. 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | Free film lecture. "Holland," 2:30 p.m. 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | Free film lecture, "Canada's Western Frontier," 2:30 p.m. 16 |
| ST. PATRICK'S DAY 17 | 18 | 19 | Museum's 3-year, $25 Million Capital Campaign ends in six months 20 | 21 | Free film lecture, "John Muir's High Sierra," 7:30 p.m. 22 | Free film lecture, "John Muir's High Sierra," 2:30 p.m. 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | Free film lecture, "Wildlife By Day and By Night," 2:30 p.m. "Contemporary African Arts Festival" opens 30 |
| 31 | | | | Field Museum hours: 9 am to 5 pm daily *except* 9 am to 9 pm Fridays | FEBRUARY 1974<br>S M T W T F S<br>1 2<br>3 4 5 6 7 8 9<br>10 11 12 13 14 15 16<br>17 18 19 20 21 22 23<br>24 25 26 27 28 | APRIL 1974<br>S M T W T F S<br>1 2 3 4 5 6<br>7 8 9 10 11 12 13<br>14 15 16 17 18 19 20<br>21 22 23 24 25 26 27<br>28 29 30 |

**field museum of natural history**

Cement lion, by Adebisi Akanji, Nigeria. (Collection of Mr. and Mrs. Kale Williams)

# april 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Museum Traveler Day program: Journey awards and free film for children, 10:30 a.m.<br>Free film lecture, "Vanishing Africa," 2:30 p.m. 6 |
| PASSOVER<br>PALM SUNDAY 7 | 8 | 9 | 10 | 11 | Free film lecture, "Aldabra: Island in Peril," 7:30 p.m.<br>GOOD FRIDAY 12 | Free film lecture, "Aldabra: Island in Peril," 2:30 p.m. 13 |
| EASTER 14 | 15 | 16 | 17 | 18 | 19 | Free film for children, 10:30 a.m.<br>Free film lecture, "Alaska—Wilderness Lake," 2:30 p.m. 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | Free film for children, 10:30 a.m.<br>Free film lecture, "Scotland," 2:30 p.m. 27 |
| 28 | 29 | 30 | | | | |

Field Museum hours:
9 am to 5 pm daily
*except* 9 am to 9 pm
Fridays

MARCH 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | | | | | | |

MAY 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

*District Officer*, wood carving, by Thomas Ona, Nigeria.
(Collection of Dr. Robert P. Armstrong)

# may 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | "Taxidermy at Field Museum" exhibit opens 1 | MEMBERS' NIGHT 2 | MEMBERS' NIGHT 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| MOTHERS' DAY 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | Field Museum's permanent building in Grant Park opened in 1921 21 | 22 | 23 | 24 | 25 |
| 26 | MEMORIAL DAY 27 | 28 | 29 | 30 | 31 | |

Field Museum hours: 9 am to 6 pm daily *except* 9 am to 9 pm Fridays

APRIL 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | | | |

JUNE 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | | 1 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | | | | | | |

**field museum of natural history**

*Uyorwi Erhue*, color etching, by Bruce Onobrakpeya, Nigeria.
(Collection of Margaret Hardin Friedrich)

# june

# 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | | Summer Journey for children begins 1 |
| Field Museum first opened in Jackson Park, 1894 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| FATHERS' DAY 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | | | | Field Museum hours: 9 am to 6 pm daily *except* 9 am to 9 pm Fridays and nights of Grant Park concerts | | |

MAY 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

JULY 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

**field museum of natural history**

Necklaces, Kenya. Right: by Joseph Abuti, fashioned of brass, talapia fish bone, and nuts. (Collection of Mr. and Mrs. James P. Wahlman) Left: by Kimani, fashioned of talapia fish bone, ostrich egg, and copper. (Field Museum collection.)

# july 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | INDEPENDENCE DAY 4 | 5 | 6 |
| 7 | Guided tours every weekday at 2:00 p.m. in July 8 | 9 | 10 | Free movies for children, 10:00 a.m. and 1:00 p.m. 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | Free movies for children, 10:00 a.m. and 1:00 p.m. 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | Free movies for children, 10:00 a.m. and 1:00 p.m. 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

Field Museum hours:
9 am to 6 pm Mondays, Tuesdays, Thursdays;
9 am to 9 pm Wednesdays, Fridays, Saturdays, Sundays

JUNE 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | | 1 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | | | | | | |

AUGUST 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

**field museum of natural history**

Carved gourd bowl with lid, by Wahabi Azeze of Oyo, Nigeria. (Collection of Mr. and Mrs. James P. Wahlman)

# august 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 |
| 4 | Guided tours every weekday at 2:00 p.m. in August 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

Field Museum hours:
9 am to 6 pm Mondays, Tuesdays, Thursdays;
9 am to 9 pm Wednesdays, Fridays, Saturdays, Sundays

JULY 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

SEPTEMBER 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | | | | | |

**field museum of natural history**

Traditional "Mwaash a Mbooy" mask, by the Bakuba people, Zaire. (Field Museum collection)

# september 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| Fall Journey for children begins 1 | LABOR DAY 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | Charter for Museum obtained in 1893<br>"Neanderthal Burial" exhibit opens 16 | ROSH HASHANAH 17 | 18 | 19 | Museum's 3-year, $25 Million Capital Campaign ends 20 | 21 |
| 22 | 23 | 24 | 25 | YOM KIPPUR 26 | 27 | 28 |
| 29 | 30 | | | | | |

Field Museum hours:
9 am to 5 pm daily
*except* 9 am to 9 pm
Fridays and September 1; 9 am to 6 pm
September 2

AUGUST 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

OCTOBER 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

**field museum of natural history**

*The Naming of the Oba*, by Daniel Ole Banidele, Nigeria; wood. (Collection of Mr. and Mrs. Kale Williams)

# october 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | "In Beauty It Is Begun" exhibit opens 1 | 2 | 3 | 4 | Children's morning workshop 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | Children's morning workshop 12 |
| 13 | COLUMBUS DAY 14 | 15 | 16 | 17 | 18 | Children's morning workshop 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | Children's morning workshop 26 |
| 27 | VETERANS' DAY 28 | 29 | 30 | HALLOWEEN 31 | | |

Field Museum hours:
9 am to 5 pm daily
*except* 9 am to 9 pm
Fridays

SEPTEMBER 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | | | | | |

NOVEMBER 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |

**field museum of natural history**

Nigerian waterpot, by Ladi Kwali, Nigeria; clay.
(Field Museum collection)

# november 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | 1 | Children's morning workshop 2 |
| 3 | 4 | ELECTION DAY 5 | "Eskimo Art" exhibit opens 6 | 7 | 8 | Children's morning workshop 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | Children's morning workshop 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | Children's morning workshop 23 |
| 24 | 25 | 26 | 27 | THANKSGIVING DAY 28 | 29 | Children's morning workshop 30 |
| | | | | Field Museum hours: 9 am to 4 pm Mondays through Thursdays; 9 am to 9 pm Fridays; 9 am to 5 pm Saturdays and Sundays | OCTOBER 1974<br>S M T W T F S<br>1 2 3 4 5<br>6 7 8 9 10 11 12<br>13 14 15 16 17 18 19<br>20 21 22 23 24 25 26<br>27 28 29 30 31 | DECEMBER 1974<br>S M T W T F S<br>1 2 3 4 5 6 7<br>8 9 10 11 12 13 14<br>15 16 17 18 19 20 21<br>22 23 24 25 26 27 28<br>29 30 31 |

**field museum of natural history**

*The Ogogoro Man in His Intoxicated Dream*, painting, by Twins Seven Seven, Nigeria. (Collection of Dr. Robert P. Armstrong)

# december 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| Winter Journey for children begins 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | FIRST DAY OF HANUKKAH 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | CHRISTMAS DAY Museum Closed 25 | Guided tour at 2:00 p.m. 26 | Guided tour at 2:00 p.m. 27 | 28 |
| 29 | Guided tour at 2:00 p.m. 30 | Guided tour at 2:00 p.m. 31 | | | | |

Field Museum hours:
9 am to 4 pm Mondays through Thursdays;
9 am to 9 pm Fridays;
9 am to 5 pm Saturdays and Sundays

NOVEMBER 1974

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |

JANUARY 1975

| S | M | T | W | T | F | S |
|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

field museum of natural history